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DOUBLE LUXATION OF THE EYEBALLS IN A CASE OF EXOPHTHALMIC GOITER . . . . . WALTER R. PARKER

THE RELATION OF HEADACHE TO FUNCTIONAL MONOCULARITY . . . . . ALBERT C. SNELL

SOME FEATURES IN THE TECHNIQUE OF TREPHINING THE CORNEA FOR THE RELIEF OF GLAUCOMA . . . . . FREDERICK TOOKE

PRESBYOPIA . . . . . E. FUCHS

DIFFERENTIAL PUPILLOSCOPY . . . . . OTTO BARKAN

EARLY CATARACT (SENILE), PTOSIS, AND AFTER-CATARACT . . . . . HENRY SMITH

DISCUSSION ON THE DIAGNOSIS AND TREATMENT OF CONGENITAL SYPHILIS . . . . . P. G. DOYNE

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE . . . . . CONRAD BERENS, JR.

(Complete contents inside)

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About three quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of ophthalmology, and to reports of societies, book reviews, and miscellaneous notes, all of it original.

The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Archiv für Augenheilkunde*) either in full or in more or less abridged translations, and *vice versa*. Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editors, obtain a reprint which he is expected to return after perusal. The subscription price of the ARCHIVES OF OPHTHALMOLOGY is $6.00 per year payable in advance. The price per number is $1.00.

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ARCHIVES OF OPHTHALMOLOGY.

DOUBLE LUXATION OF THE EYEBALLS IN A CASE OF EXOPTHALMIC GOITER.

BY DR. WALTER R. PARKER, DETROIT, MICHIGAN.

(*With two illustrations on Text-Plate I.*)

A. K., male, aged sixty years. German. Patient entered the Ophthalmic Clinic of the University of Michigan January 5, 1921. Family and previous personal histories were negative. The date of the onset of his present disease was indefinite. He had noticed a bulging of his eyes for several months, and had been very nervous at times. Seven weeks before the time of admission to the hospital he had observed a marked increase in the bulging of his eyes, followed by rapid failure of vision, with resulting blindness one week before admission. Up to the time of the marked bulging of his eyes his occupation consisted in lifting bags of coal from a conveyor belt to trucks. The weight of each bag was from 80 to 100 pounds and he lifted about three hundred each day.

Examination.—The patient was undernourished and obviously under weight. He had general weakness, tachycardia, tremor, and moist skin. Blood Wassermann, 1 +. X-ray examination, including the sinuses, was negative. Oral examination showed no foci of infection. The medical report was in effect that the patient had all the symptoms of hyperthyroidism. Basal metabolism—first test, 50% over normal; second test, 76% over normal.

V.R.E., light perception; L.E., nil. Both eyes were luxated, the lids being partially closed back of the equator of the globe. Ocular movements were present in all directions, though somewhat limited in degree. The lids were flaccid and could be easily separated from the globe. There was present a marked exposure chemosis in the portion of the

globe not covered by the lids, and a slight mucopurulent discharge covered both eyes. The entire cornea in each eye was infiltrated and œdematous, and a large central ulcer was present in both eyes. The cornea of the left eye had perforated. The ophthalmometer reading was: right eye, *24mm.*; left eye, *23mm.* Bacteriologic examination, staphylococcus albus.

Treatment consisted of rest in bed and high caloric diet. Enucleation of the left eye was advised, but permission was refused by the patient. The ulcers were treated with silver and argyrol. The discharge disappeared in about two weeks, in which time an attempt was made to reduce the proptosis by pressure. The cornea was smeared with vaseline, a rubber protective placed over the eye, and a bandage applied. In six weeks' time the proptosis had improved to such a degree that the lids could be closed over the eyeball. The patient's general condition so improved that after two and one half months' stay in the hospital he had gained 25 pounds in weight and the proptosis had so diminished the lids could be closed.

Fig. 1 is a reproduction of a photograph of the patient on admission to the hospital, and Fig. 2 shows how he appeared two and one half months later.

Luxation of the eyeball is of rare occurrence in exophthalmic goiter. While it is only an incident in the course of the disease, the treatment must be immediate and drastic or the effect on the vision may be most disastrous.

Our knowledge of the ætiology of the cardinal symptoms of exophthalmic goiter is still too indefinite to permit of more than conjecture in regard to the causes of the disease. But, assuming that congestion of the blood-vessels plays a part in the exophthalmos, it may not be unreasonable to suggest that the lifting of three hundred eighty-pound weights each day, as in the case reported, was one of the contributing factors in the causation of the extreme exophthalmos.

Treatment.—The general treatment of Graves's disease will not be considered at this time.

In regard to the local treatment that may be employed in these rare cases of extreme proptosis, I can merely offer suggestions resulting from the experience in the case reported and from information acquired from a somewhat incomplete review of the literature.

The treatment has included the use of the Buller shield,

ILLUSTRATING DR. WALTER R. PARKER'S ARTICLE ON "DOUBLE LUXATION OF THE EYEBALLS IN A CASE OF EXOPHTHALMIC GOITER."

FIG. 1.

Photograph of patient as he appeared on admission to the hospital.

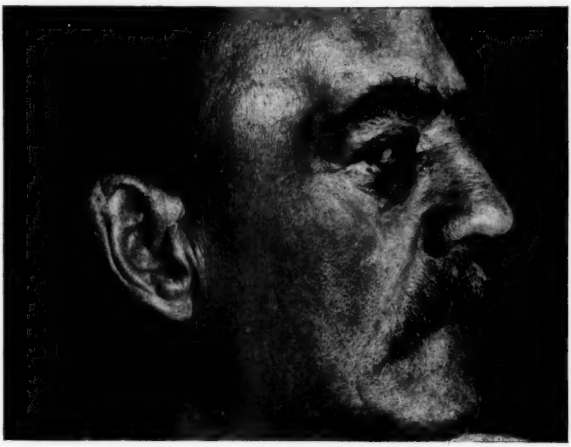


FIG. 2.

Photograph of patient as he appeared two and one half months after admission to the hospital.

uniting the conjunctiva over the cornea; tarsorrhaphy alone, or in combination with canthoplasty or slitting the upper and lower lids, or with the removal of a considerable amount of fat from the orbit.

Mr. F. A. Juler[1] reported a case of purulent keratitis treated by tarsorrhaphy, resections of the cervical sympathetic, and X-ray. One eye was lost, but vision of $\frac{6}{12}$ was preserved in the other. When the patient, a woman aged thirty-six years, came under observation, there was extreme exophthalmos, hypopyon, and suppurative keratitis in one eye, while in the other the exophthalmos was not so marked and there were no inflammatory symptoms present. The right eye was removed after panophthalmitis developed. The cornea in the left eye became roughened, conjunctiva congested, and movement limited. The external canthus was divided, and tarsorrhaphy performed after slitting the lids. The lids separated after the fourth day. One week later the cervical sympathetic was resected, the cornea covered with conjunctiva, and the lids were again united. After ten days the lids again separated. Mattress sutures were then introduced, but they also failed to hold, and the cornea became infected. Later canthotomy was performed and conjunctivoplasty repeated. The lids remained closed ten days, the cornea healed, and no further ulceration occurred. Final vision, $\frac{6}{12}$.

Mr. Coulter, in discussing Mr. Juler's paper, reported the history of a case in which one eye was lost. As soon as the second eye showed signs of corneal involvement a tarsorrhaphy was performed and the lids were kept closed for months. Recovery with good vision. In the same discussion Mr. Paton referred to a case in which both eyes were lost in spite of the fact that a tarsorrhaphy was attempted three times. Each time the stitch pulled out. Von Poppen[2] reported a history in which the exophthalmos was extreme. He divided the outer canthus, but did not do a tarsorrhaphy. Both eyes were lost. Knapp succeeded in preserving the vision by suturing the lids, after making incisions after the manner of Harman. Sattler[3] referred to 40 cases of corneal involvement in exophthalmic

[1] *Trans. Oph. Soc. U. K.*, 1913.
[2] *Deutsch. med. Woch.*, xxxvi.
[3] *Graefe-Saemisch Handb.*

goiter in which both eyes were lost; 9 cases had complete loss of vision in one eye and partial loss in the other; and 14 cases had complete opacity in one eye. While this list is in no way complete in regard to the number of cases reported, it is sufficient to indicate that the salvation of the cornea rests in some form of mechanical protection.

In order that the lids may be more firmly united, two suggestions have been made—one by Mr. Bishop Harman, namely, that in order to relieve the tension on the lids, a wide incision be made through the skin in the upper lid just below the brow, in the lower lid just above the orbital margin. The raw surfaces present no difficulty, as the skin can be reunited if the expedient is temporary, or grafted, if permanent. Another mode of procedure is suggested by Foster Moore.[1] He successfully closed the lids in a case of extreme exophthalmos in Graves's disease by first removing a large amount of fat from the orbit through an incision made in the inferior fornix. While this procedure seems somewhat drastic, it appeals to the author as one that might well be employed in this group of serious cases.

[1] *Lancet*, 1920.

THE RELATION OF HEADACHE TO FUNCTIONAL MONOCULARITY.[1]

By Dr. ALBERT C. SNELL, Rochester, N. Y.

(With graph on Text-Plate II.)

HEADACHE is indisputably the most common symptom for the relief of which patients consult the ophthalmologist. Snydacker found that in 2000 consecutive patients ⅖ or 40% complained of headache. Brav in 3000 consecutive cases found that 30% asked relief from headache, there being no other symptoms. Approximately three out of every four of our patients (excluding those with acute inflammatory conditions) complain of headache or give a history of having had headache in some form. Yet there are many patients who rather surprise us by stating that they do not have, or that they never have had headache. Volumes have been written about headache, especially that associated with eye strain or some form of ocular maladjustment, but scarcely anything has been said about the acephalalgic patient. Therefore I trust that the statistics which I herewith present may have some scientific value and interest. This paper is the study of one thousand ten cases of partial or of complete functional monocularity, and the relation of such conditions to the prevalence of headache.

When one considers the class of cases which are relatively less subject to headache, it seems to be quite universally accepted that the higher degrees of hypermetropia are less likely to cause asthenopic symptoms than the lower or the intermediate degrees; and that myopia, corrected and uncorrected, is less likely to cause headache than hypermetropia. One author presents these observations by saying, "Poor vision excludes

[1] Read at the meeting of the American Ophthalmological Society, Swampscott, June 14, 1921.

eye-strain." The question of the prevalence of headache among the blind has been studied by Walton who found that 66% of persons blind from infancy were free from headache. Later he investigated the frequency of migrainous headache among the blind and found it only one-half as frequent among the blind as among seeing persons of like age and conditions.

Several years ago I was impressed with the fact that many patients with only one useful eye often gave a history of the absence of headache. A search through the literature revealed only a few references relative to this observation. I found the unique and well-known case of Dr. Noyes in which the removal of a nearly normal eye, having standard vision, afforded complete relief to a patient who had suffered for years almost constant "agonizing headache" and other asthenopic symptoms. Ranney states that "a typical cross-eye is not, as a rule, the cause of serious nervous disturbance.... Eye-strain is practically absent in extremely cross-eyed subjects." Wilder in writing of the visual standards in the army states that persons with congenital amblyopic eyes are "seldom annoyed by asthenopia, if the fellow eye has fairly good vision and no great refractive error, for they do not have binocular single vision." Oliver in the chapter on ametropia in Norris and Oliver's "System of Diseases of the Eye" says: "Were the human eye cyclopic, the problem (asthenopia) would be easier of solution, and eye-strain would be less disastrous in its consequences." Donders (*Accommodation and Refraction of the Eye*, p. 415) as early as 1864 made the observation that asthenopia was overcome by strabismus convergens or divergens, and expressed the fact in the following striking antitheses:—

"Hypermetropia causes accommodative asthenopia, to be actively overcome by strabismus convergens.

"Myopia leads to muscular asthenopia, passively yielding to strabismus divergens."

Although all of these references indicate at least a mitigation of asthenopic symptoms in proportion to the loss or absence of single binocular vision, I could find no reference to any statistics to substantiate these opinions or my own belief that the monocular are comparatively free from headache.

Therefore I have undertaken a study of a series of cases falling within the class of the functionating monocular believing that such a study would be interesting and would shed some light on this subject. I have taken from my files 1010 cases having different degrees of monocularity and have tabulated them. In the tabulation I have recorded for each patient, the age, occupation, refraction, visual acuity, muscle balance, condition of general health, and the presence or absence of headache or head-pain. For simplicity, the cephalalgias were divided into two classes only, the severe or habitual, and the mild or occasional.

In selecting the cases for tabulation the following were excluded: cases under fifteen years of age; cases in which the vision of the better eye was less than $\frac{20}{25}$, and those clearly showing the presence of some active local or constitutional disease. In excluding persons under 15 years of age we felt that prior to this age a sufficient period of time should not have elapsed to establish the fact of the presence or absence of habitual headache; that the personal history of these patients in regard to headache would often be unreliable; and further, that prior to fifteen, especially with girls, many other factors incident to the beginning of adolescence enter in the ætiology of headache. Only those cases in which there was present a central visual acuity of $\frac{20}{20}$ or $\frac{20}{15}$ in the better eye were used, as a perfect, or nearly perfect vision in one eye was desirable in considering monocularity. The visual test was recorded and considered with the use of glasses when the patient was wearing them, and without glasses when the patient was not using them. The reason for excluding those with active constitutional or local ocular diseases is self-evident, as such conditions would have a direct relationship to the presence of headache.

Considering the different degrees of disturbances of binocular single vision the cases seemed rather naturally to fall into the following four groups: I. The one-eyed; II. The anisometropic; III. The amblyopic; IV. The strabismic. The first group contains all those cases which had lost one eye, considering only those in which the monocularity had existed for five years or more, and those having only one good eye, the other eye having an acuity of less than $\frac{10}{200}$; the second group includes those cases of anisometropia in which binocular single vision

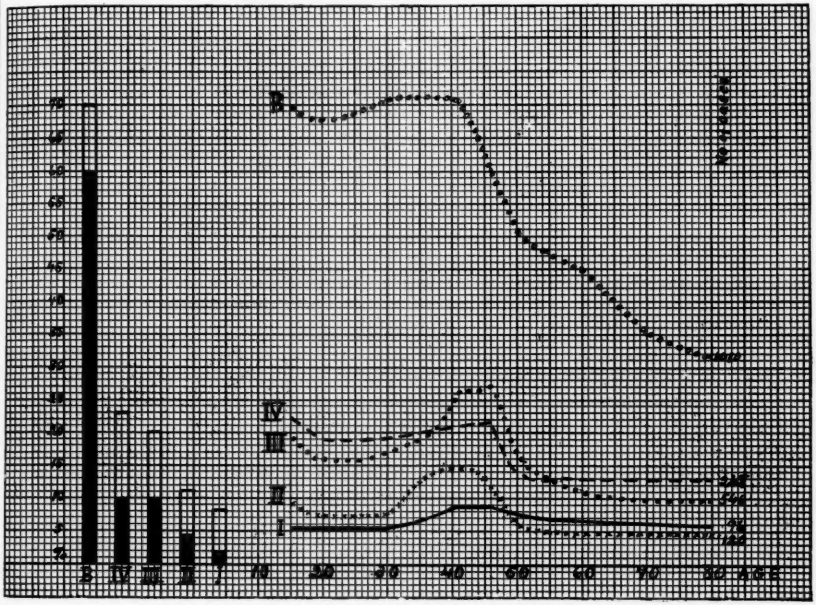
was not present or in actual use, also a limited number of cases presenting a very marked dominance of one eye although in these latter cases single binocular vision was present and visual acuity was standard in each eye; the third group includes all cases of monocular amblyopia; the fourth group includes all cases of strabismus both convergent and divergent, constant or intermittent.

TABLE SHOWING THE NUMBER OF CASES AND THE PERCENTAGE OF HEADACHE

Group	*Kind or Degree of Monocularity*	*Total Number of Cases*	*Number Without Headache*	*Number Having Habitual Headache*	*Number Having Occasional Headache*	*Total Number Without Headache*	*Percentage of Headache*
B	Binocular	1010	298	606	106	712	70
I	One eyed or Absolute monocularity	96	88	2	6	8	8.3
II	Anisometropia or Suppressed monocularity	120	105	5	7	15	11.4
III	Amblyopia or relative monocularity	546	436	44	66	110	20.1
IV	Strabismus or Functional monocularity	248	192	24	32	56	22.6
	Total for Groups I, II, III, and IV	1010	821	75	111	189	18.7

Group I. Complete monocularity. In this group there are 96 cases. Of these, 30 had been blind in one eye for five to twenty years; 40 had been blind in one eye for twenty to thirty years; and 26 had been blind for forty years or more. Headache of a severe or habitual type was found in only two cases. One case had suffered headache for a period of 20 years, and the other for 45 years. Six cases gave a history of an occasional or mild headache. Therefore only 2% of the absolute monocular patients showed habitual or severe headache, and 6.2% occasional or mild headache, or a total of 8.3% having any form of headache. In this group there were eight cases which

ILLUSTRATING DR. ALBERT C. SNELL'S ARTICLE ON "THE RELATION OF HEADACHE TO FUNCTIONAL MONOCULARITY."



B—binocular cases; I, II, III, IV—groups.

Solid column—percentage habitual headache cases.

Hollow column—percentage occasional headache cases.

Entire column—percentage for all headaches for each group.

Horizontal lines—percentage headache for age period for groups B and I, III, and IV.

gave a history of severe or habitual headache before losing an eye, and a complete absence of all headache after the loss of an eye.

Group II. Anisometropia or suppressed monocularity. In this group are included two classes of cases: first, those of unequal vision (anisopia) due to a high degree of anisometropia so that only one eye was functionating with good central visual acuity; while the other, although having a possible standard visual acuity with proper glasses, did not or could not adapt itself to the use of the correction for that eye having the greater refractive error. Generally there was a difference in the spherical correction of the two eyes of more than four diopters. Second, those with one very dominant eye but with equal vision (isopia), the monocular dominance being determined by the winking test of Rider and because of an habitual desire or habit almost constantly to close one and the same eye.

In this group there are 120 cases of which 93 had anisopia and 27 isopia. Of the former 5 or 5.3% had severe or habitual headache, and 6 or 6.4% occasional or mild headache; and of the latter none had severe or habitual headache and 1 or 4% had mild or occasional headache. Taking the group as a whole and including both classes of headache, the total percentage of headache was found to be 11.4%.

In three of the cases of anisometropia a persistent attempt had been made to use correcting glasses, but these always caused the recurrence of severe headache. Without the glasses or with only the better eye corrected, these patients were perfectly comfortable and free from headache.

Group III. Amblyopia or relative monocularity. This group includes all cases of monocular amblyopia. These cases were divived into four classes depending on the visual acuity of the amblyopic eye. The best vision with correcting glasses was taken in every case and the question of cephalalgia was considered with the use of correcting glasses. In each class are included all cases with vision in the amblyopic eye as follows: (Vision in the nonamblyopic eye with glasses being $\frac{20}{15}$ or better) Class A, $\frac{20}{30}$–$\frac{20}{40}$; class B, $\frac{20}{50}$–$\frac{20}{60}$; class C, $\frac{20}{80}$–$\frac{20}{100}$; class D, $\frac{20}{200}$–$\frac{20}{200}$. In class A there are 120 cases. Of these, 10 or 8.3% had severe or habitual headache and 24 or 20% had slight or occasional headache. In class B there were 122 cases. Of

these 4 or 3.2% had severe or habitual headache and 14 or 11.6% had occasional or mild headache. In class C there were 119 cases. Of these 8 or 6.7% had severe or habitual headache and 10 or 8.3% had mild or occasional headache. In class D there were 185 cases. Of these 18 or 10% had severe or habitual headache and 23 or 12% had mild or occasional headache. Comparing the classes in this group we find that the percentage of headache, considering both classes of headache together, show a proportionate decrease with the decrease of visual acuity in the amblyopic eye, except in class D where the total percentage of headache considerably increased. The percentage for each class was A, 30%; B, 15%; C, 14%, and D, 24%. I find that in class D I had included eight cases of migraine associated with severe headache. Had these been omitted the percentage in this class would have been 17 instead of 24. The total percentage of headache for all classes in this group is 20.1%.

Group IV. In this class are placed all strabismus cases of every form or degree. There are a total of 248 cases; 7 had vertical deviation, 114 were convergent cases, and 127 were divergent cases. In 6 of the convergent cases, and in 39 of the divergent cases, the squint was not constant. Of the total 114 convergent cases 12 or 10% had a history of habitual or severe headache, and 15 or 13% slight or occasional headache. Of the total 127 divergent cases 12 or 9% had habitual or severe headache and 17 or 13% slight or occasional. The convergent and the divergent show practically the same percentage of prevalence of headache.

Considering all forms of strabismus together, out of the total of 248 cases, 24 or 10% had severe or habitual headache, and 32 or 13% had occasional or mild headache, making a total for all forms of headache of 22.6% for the strabismus cases. In this group there was one case of isopia with intermittent convergent strabismus who suffered nearly daily with headache, especially after close work until he learned to cover up one eye. This gave complete relief from the headache.

Considering all four groups together for the purpose of comparing the frequency of headache we find that group 1 (absolute monocularity) shows the lowest percentage of headache, only 2% having habitual or severe headache. Then comes

group II in which there was functional suppression of single binocular vision (cases of high anisometropia) with 4.1% of habitual or severe headache. Next in order follow groups III (amblyopia) 8%, and group IV (strabismus) 10% with habitual or severe headache.

Considering both classes of headache, the habitual or severe and the occasional or slight together, the percentages as shown in the graph are for group I, 8.3%; for group II, 11.4%; for group III, 20.1%; and for group IV, 22.6%. Thus we find that there was a proportionate smaller percentage of headache in proportion to the greater degree or completeness of monocularity.

In a review of the consecutive records of one thousand ten private cases having good binocular single vision (all cases falling under any of the groups considered in this paper being excluded, as well as all inflammatory cases) I find that the percentage of such cases having headache is 70, the habitual or severe headache being complained of in 60%, and the occasional or mild in 10%. Thus a comparison of an equal number of records of patients having constant binocular single vision with the monocular will show that severe or habitual headache occurs seven times more frequently in the former than in the latter.

There are many illustrative normally monocular patients in this series which demonstrate our premises in a converse way in that, by attempting to produce coördinate use of the eyes, severe and unconquerable asthenopic symptoms were produced. I shall not burden this paper with case histories but shall insert abbreviated records of two cases one of which illustrates the above point, and one which seemed to show that by establishing monocularity a severe cephalalgia and other asthenopic symptoms were relieved.

CASE 1.—Mr. J. P. H. 55 years of age, a college graduate, teacher by profession. Has never enjoyed very good health, usual weight 125 lbs. Has had recurrent symptoms of fatigue neurosis. Ocular history: 28 years ago had an operation for a divergent strabismus. Has always been nearsighted, and has worn glasses since boyhood.

Refraction at present:

Right Eye -6.00 S. $= -.75$ Cy. Ax. $35^\circ = \frac{20}{15}$ V.
Left Eye -1.50 S. $= -.75$ Cy. Ax. $180^\circ = \frac{20}{15}$ V.

Has fusion, but maintains it with difficulty; slight convergence. For the past ten years has used full correction for the left eye, and -3.25 S. $= -.75$ Cy. for the right eye. With this latter correction he has enjoyed perfect ocular comfort and has been entirely free from headache, using the left eye for distant vision and the right eye for near. About ten years ago he tried persistently under the care and direction of a competent oculist to use the full correction for each eye, but was unable to do so because of severe asthenopic symptoms which this produced.

CASE 2.—Mrs. H. R. H., 39 years of age. General health good, has not had any serious illness, but has always had a nervous temperament and describes many recurrent attacks typical of neurasthenia. Ocular history: Has suffered considerable headache over a period of many years and has never been able to use her eyes without distressing symptoms. While in college was under the care of a well-known specialist who spent several months in an attempt to give her proper correcting glasses. During this time she was unable to follow her college work, and lost several months' time. Has used glasses for 25 years. Without glasses central vision in the right eye is $\frac{20}{60}$; in the left $\frac{20}{70}$. Refraction under cycloplegic:

Right eye $-$ 1.75 S. $= \frac{20}{20}$ V.
Left eye $+$ .12 Cy. Ax. 90° $= \frac{20}{20}$ V.

This is practically the same correction which she used while in college and since. She was told that it was very essential that she wear her glasses, therefore has done so. On April 18, 1919, the writer advised her to go entirely without glasses. Since laying them aside she has been very much more comfortable, has been able to use her eyes for longer periods, and has been entirely free from headache. She states that during the past two years she has not known what a headache was, and that she has never been so comfortable in all her life. With the full correction there is only a very slight muscle imbalance. In 1919 ½ degree of exophoria. March 18, 1921, exophoria 1½, right hyperphoria ½.

A study of the age epoch in the relation to the frequency of headache reveals a striking similarity both in the binocular and in the monocular there being a slight peak of greater proportion between the ages of 15 and 20 years, then a sharp but small decline, the percentage then being maintained at a nearly uniform ratio between 20 and 35. Between 35 and 45 the

proportion of headache greatly increases reaching the highest peak at 45 or 46. From this age the percentage curve is sharply downward, passing below the curve of youth and adolescence at 55. From this age onward there is little fluctuation.

An explanation for the infrequency of headache in the monocular patient as compared with the patient employing single binocular vision is found in the fact that the former, because of his monocularity, must experience less nervous or brain fatigue, the normal monocular visual act being less complex, because of the elimination of the fusion sense and of coördinate muscular adjustment which are necessary in maintaining single binocular vision.

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SOME FEATURES IN THE TECHNIQUE OF TREPHINING THE CORNEA FOR THE RELIEF OF GLAUCOMA.[1]

By Dr. FREDERICK TOOKE, Montreal.

(With seven illustrations on Text-Plates III.–V.)

AN approach to my subject cannot better be made than to quote Mr. Priestley Smith's remarks in introducing the discussion on the operative treatment of glaucoma at the Seventy-ninth Annual Meeting of the British Medical Association, held at Birmingham, in 1911. He asks the pertinent question: "In operating for glaucoma, ought we to adhere to the time-honored iridectomy of von Graefe, or to adopt one or other of the substitutes lately introduced? The object of every glaucoma operation is to establish filtration from the eye; if we fail in that we fail entirely."

Glaucoma cannot well be described by any one stereotyped definition. A series of pathological, or rather of ætiological, features underlying the symptoms acknowledged clinically as glaucoma have been presented of recent years. These are as many as they are varied. Burgers, Wessely, Parisotti, Kummel, Hamburger, Bjerrum, Parsons, Thompson, Martin Fisher, and Priestley Smith, himself, are some of the contributors who have attempted to solve the riddle of our science. Almost as many have presented operative procedures designed to minimize, if not to actually eliminate, the symptoms which these pathological features have induced. The outstanding contributors of recent years have been Lagrange, Herbert, and Elliot, the object of each being to establish a filtering scar.

[1] Presented at meeting of the American Ophthalmological Society at Swampscott, June, 1921.

ILLUSTRATING DR. FREDERICK TOOKE'S ARTICLE ON "SOME FEATURES IN THE TECHNIQUE OF TREPHINING THE CORNEA FOR THE RELIEF OF GLAUCOMA."

FIG. 1.

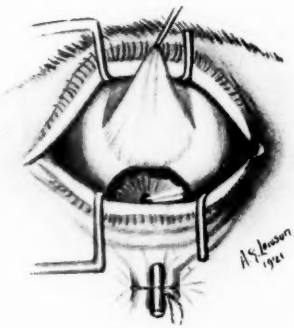

FIG. 2.

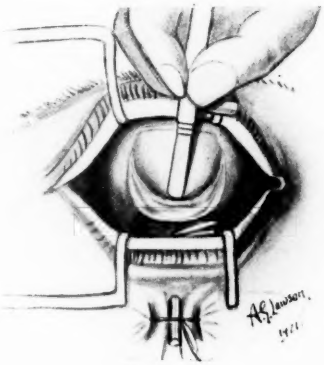

FIG. 3.

The purpose of this contribution is not to bring into discussion the merits or faults of the operations designed by the authorities whom I have mentioned: it would be an impertinence on my part to attempt to do so. My brief for the time being is with the technique of trephining the cornea as advocated by the chief exponent of the operation, Colonel H. R. Elliot, as the operation with which I am most familiar.

It is quite probable that an enthusiastic support of this procedure will not go unchallenged by some, if not by many. To these I may as well at once reply by enquiring of them if they, in cases of chronic glaucoma, have, through their actual operative experience, anything better to offer as an operative procedure that will more consistently and with less risk diminish tension, maintain vision, and retain blind eyes whose lot was formerly an enucleation. May I further be permitted to enquire if the terror of a late infection has not been one of anticipation, rather than one of actual fact in many, many cases? I feel sure that my colleagues at the Royal Victoria Hospital, Montreal, would wish to share with me in making the following assertions. That we have practiced the operation of trephining the cornea for the relief of chronic glaucoma consistently since it was first introduced to this continent, and even before that time. Further, that in a series of nearly one hundred and fifty cases we have had less than two per cent. of late infections. That there has not been one case of initial infection recorded, and that our material has, as in any large city, included all classes of society, from pauper to patrician.

As Colonel Elliot very aptly remarked in one of his contributions on this subject: "Magna est veritas et prevalebit." The selection of my subject must not be interpreted as a presumption. The few following remarks on operative technique are the acknowledgment of an opportunity of acting as Colonel Elliot's assistant during his visit to Montreal in 1914. The enthusiastic and kindly interest which he evinced during the progress of several operations impressed us all most forcibly at the time how best the operation might be performed, and how pitfalls and possible complications might be avoided.

Since undertaking the operation on my own responsibility, or when assisting my colleagues in the department, I have always felt that one of the greatest difficulties experienced was

to keep the patient looking down. Compared with a cataract extraction, or even with an iridectomy, trephining is a slow, tedious operative procedure. There is always the desire on the part of the patient to look up, call it curiosity if you will, and even though traction be applied by fine forceps below, or pressure by a horn spatula above, at some unguarded moment when these are released the patient looks up with the result that the conjunctival flap in the process of dissection is buttonholed.

It is at the present time my practice to fix the eye downward by a double armed suture. After anæsthetizing the conjunctiva and cornea, a few drops of two per cent. anocain solution are injected into the lower lid. The needles, which should be moderately long and curved, should be inserted in a horizontal direction at the limbus corneæ below, and should include some of the episcleral fibrous tissue, very much as in the case of an advancement operation. The needles should then be passed downwards in a vertical direction, beneath the conjunctiva bulbi, as far as the lower fornix, being brought forward through the skin surface of the lid in a line with the lower margin of the orbit. Traction is brought to bear on the two ends of the suture until the globe assumes the desired position, when the suture is secured about a small piece of rubber tubing. After the introduction of an eye speculum, the operation may be proceeded with. (Figures 1 and 2.)

If there is one point more than another upon which all who support this operation are agreed, it is that the trephine must pass entirely through corneal tissue; and for this reason. The object of the trephine hole is to drain the aqueous through the cornea from the anterior chamber to the subconjunctival capillaries. It has been computed that the corneoscleral margin lies 1*mm* forward of the actual filtration angle (Priestley Smith). Should one operate with a 2*mm*, or even with a 1.5*mm* trephine, the actual corneal tissue not being exposed, it would be impossible to reach the anterior chamber without wounding the ciliary body, subsequently plugging the wound with pigment and lymph exudate, the result of a complicating cyclitis. Satisfactory filtration can best be secured by a procedure known as splitting the cornea, a point emphasized by Colonel Elliot in all his writings. It is, in my humble opinion, the salient feature of the operation.

How best, then, may one approach the cornea, and how best expose that portion required to accommodate the trephine without complicating any of the underlying structures. The idea is to dissect or undermine the conjunctival flap so that its mid portion will expose the actual corneo-scleral margin. This mid point of dissection is extended still further forward into the corneal tissue proper, towards the apparent limbus of the cornea, thus exposing a tiny crescentic or semilunar patch of actual corneal tissue. This area may measure between 1 and 2*mm* in a vertical diameter and lies directly behind the attached or hinged end of the conjunctival flap. I have seen various instruments used in the execution of this the most tedious, but, I claim, the most important step of the operation. A knife-needle, a blunt keratome, the separated blade of the scissors used in dissecting the conjunctival flap, all with the same facility of buttonholing the conjunctiva.

For some time past it has been my practice to use an instrument which I have called for want of a better name, a corneal separator. I made the original by grinding down an old Beer knife. The blade is short, it's cutting surface is 4*mm* wide, it is rounded at the end and beveled on both surfaces. When properly approximated to the cornea it is, consequently, almost impossible to buttonhole the cornea forward on the one hand, or to completely penetrate the substantia propria backward on the other. The instrument actually resembles a very fine mastoid chisel. A sufficient area of the substantia propria is exposed with the greatest ease, especially when the instrument is used with a lateral motion rather than vertically alone. It was made for me by Messrs. Tieman & Company, New York, to whom my thanks are due. The proper use of this very simple instrument has afforded us an opportunity of out-Ellioting Elliot at this particular and important stage of the operation. (Figures 2 and 3.)

Having exposed an area of underlying corneal tissue, allow me to digress for a moment and to define very briefly the histological features of a filtering corneal cicatrix. In an uncomplicated incision of the cornea, healing begins almost immediately. The severed ends of the corneal fibers at the mid point of the substantia propria are the first to actually unite by primary intention. A secondary downgrowth of epithelial

cells and an ingrowth of endothelium follows which successfully plug the wound. As union of the corneal fibers proceeds, these plugs are pushed forward on the one hand, and backward on the other, so that when fibrous union of the substantia propria is complete, there being no inclusion in the wound, there is little or no evidence of the epithelium or endothelium remaining.

When the cornea is trephined a definite plug of corneal tissue is excised. At a circumscribed point, at least, the severed ends of the substantia propria cannot approximate. Primary union of the corneal fibers cannot take place before an ingrowth of endothelium has occurred which completely lines the trephine hole. Consequently, the apposition of the severed ends of the substantia propria is inhibited where primary union was wont to take place. A cystoid scar thus replaces a fixed scar (Figure 4).

In a recent article by Colonel Elliot appearing in the *Transactions of the Ophthalmological Society of the United Kingdom*, a series of histological sections were shown which were intended to demonstrate part of the ligamentum pectinatum in the excised corneal plug. I must confess that I am distinctly dubious in my interpretation of the presence of the fibers of the ligament in some of the sections. For, after all, why should they be included? Granted that we expose the cornea sufficiently well forward as I have already attempted to describe. If a not too large trephine be used and it be properly approximated near the hinge of the conjunctival flap, then it should penetrate the cornea forward before Descemet's membrane breaks up to form the fibers of the ligamentum pectinatum (Figure 5).

Figure 6 shows a section through the cornea near the apparent limbus for the extraction of a senile cataract. The incision has, in fact, come out well beyond the apparent limbus of the cornea with the inclusion of a conjunctival flap. Should such a conjunctival flap have been extended still further forward according to the procedure of Colonel Elliot, and one which I am attempting to emphasize, it is difficult to suppose that the proper apposition of a moderately sized trephine could possibly include any of the fibers of the ligamentum pectinatum. That it is done by himself on occasions is admitted: it is also ac-

ILLUSTRATING DR. FREDERICK TOOKE'S ARTICLE ON "SOME FEATURES IN THE TECHNIQUE OF TREPHINING THE CORNEA FOR THE RELIEF OF GLAUCOMA."

FIG. 4.

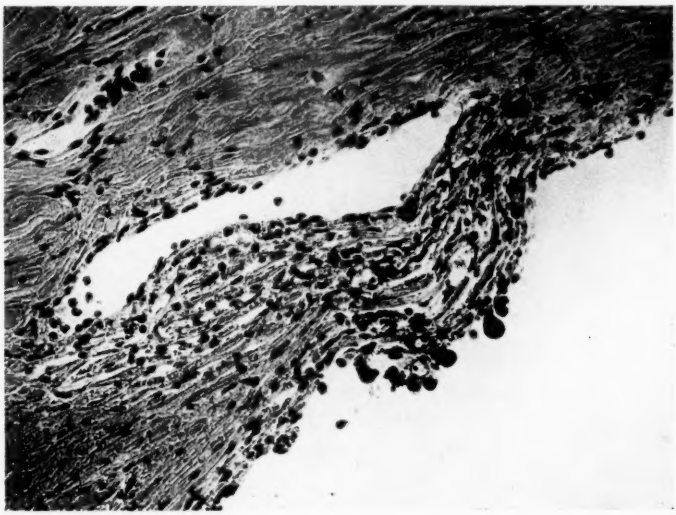

FIG. 5.

knowledged by Freeland Fergus that a fine spatula or probe is almost invariably inserted into the wound, breaking down the more underlying fibers of the ligamentum pectinatum before drainage is complete. In the operation as performed by us, we practically always meet with a hernia of the iris after trephining without having to insert any instrument whatsoever into the anterior chamber.

But need we regard the ligamentum pectinatum as a factor in the operation? Indirectly yes, and directly no; depending entirely upon the underlying pathological cause and the clinical form which the condition exhibits. Clinically we note two types of glaucoma, one with a shallow, the other with a deep anterior chamber. An excellent illustration of the first type which might be interpreted as one of the congestive variety; an engorged anterior ciliary process pushing the root of the iris forward thus blocking the natural egress of the aqueous through the spaces of Fontana and the canal of Schlemm (Figure 7). In such a condition the trephine operation relieves congestion, released filtration allows the iris to fall back to its former position, the normal depth of the anterior chamber is restored, the filtration angle consequently freed, and the circulation of the aqueous reëstablished, not only by the cystoid cicatrix, but also by the former physiological channels.

Take, on the other hand, the question of colloid changes occurring in the aqueous, a view advanced by Martin Fisher in his work on Œdema. Such a condition may manifest itself in the anterior chamber, and from an altered specific gravity the structures about the filtration angle are unable to accommodate the aqueous. Such a condition is also shown in Figure 7, but existing in the posterior rather than in the anterior chamber. A feature such as this would be relieved, primarily, by the action of the cystoid cicatrix itself, independent of any mechanical or physiological release on the parts concerned in the normal channel of circulation.

One practical point in conclusion. The operation with which I am dealing has been criticized as requiring a keen near vision and a steady hand. But such essentials are necessary in every branch of ophthalmic surgery. Granted that the trephine area is small, that we can not all be myopes, and that presbyopia is the lot of man. With such problems facing us a

means had to be found to afford one the best possible vision of the field of operation without disturbing the general relationship of existing conditions. My first practice was to employ a small loupe which was worn as a monocle, one which I was in the habit of carrying about with me for the detection of foreign bodies embedded in the conjunctiva or cornea. This served my purpose admirably. It had the distinct disadvantage, however, of not being worn with equal facility by every operator. Doctor Byers was one to appreciate this difficulty very early and adopted the practice of using a Zeiss binocular. But this proved to be clumsy and had the distinct disadvantage of closing off all but the actual field of operation. We have compromised by using the Beebe Hardy binoculars which are of inestimable assistance at every stage of the operation, but more especially in exposing the corneal fibers before the trephine is applied.

ILLUSTRATING DR. FREDERICK TOOKE'S ARTICLE ON "SOME FEATURES IN THE TECHNIQUE OF TREPHINING THE CORNEA FOR THE RELIEF OF GLAUCOMA."

FIG. 6.

FIG. 7.

PRESBYOPIA.[1]

By Professor E. FUCHS, Vienna.

I BEG to thank you most sincerely for the great honor you have done me by your invitation to read a paper before you.

I beg your indulgence for not having chosen a more interesting topic than presbyopia for my lecture, interesting maybe only by the fact that all of us have to submit to it sooner or later. Presbyopia is scarcely mentioned in modern ophthalmologic literature so that one might infer that there is a general consensus of opinions about it, which is by no means the case.

Stellwag was the first to distinguish presbyopia from hypermetropia, recognizing that there is a difference between the two as to the situation of the far point and therefore he denominated hypermetropia as hyperpresbyopia. We owe to Donders the sharp distinction between refraction and accommodation and on this ground between presbyopia as a diminution of accommodation and hypermetropia as an error of refraction, whose characteristic is the position of the far point behind the eye, independently of age and accommodation.

Already before Donders had laid down his principles in what we may call the bible of the refractionist, it was known that there was a practical difference between a presbyope and a hypermetrope in that the first could not see close objects distinctly, but also did not suffer from asthenopia, whereas the latter, as long as he was young, could see at a near distance but was prevented from prolonged work by asthenopia. Donders accounted for this by the fact that the asthenopia of the hypermetrope is due to the overstrain of the ciliary muscle,

[1] Read at meeting of the Section on Ophthalmology, New York Academy of Medicine, October 17, 1921.

the indistinct vision of the presbyope to the diminution of the elasticity of the lens, the ciliary muscle in this case contracting only as far as it is efficient, *i.e.*, is followed by an increase of refractivity of the eye. Now the opinions diverge as to the amount of ciliary contraction in presbyopia, a direct measurement of this being impossible. We can measure it only as far as it reveals itself by the increase of refractivity, therefore only in young persons in whom this increase corresponds practically to the degree of ciliary contraction. When in old age the lens does not respond more fully to the contraction of the ciliary muscle, we may in this respect suggest various conceptions, without being able to support them by definite proofs.

So Monoyer and Landolt assert, that to each fraction of the actual range of accommodation corresponds an equal fraction of the entire contraction of the ciliary muscle, whatever may be the age of the person. According to this theory the adjustment for the near point requires the maximum of ciliary contraction in an old man just as well as in a child. Hence these authors apply Donders's statements regarding the relative range of accommodation also to the presbyope. According to Donders prolonged work at a given distance is possible only if, when focusing the eye for this distance, the positive part of the range of accommodation is sufficiently great. Landolt and Monoyer admit that this is the case, if the positive part is at least one-third of the total range of accommodation, so that, for instance, a man of sixty with a range of accommodation of 1 D. can for prolonged use employ only two-thirds of it, *i.e.*, 0.67 D. and has to keep a reserve of 0.33 D. But, in fact, the laws of relative accommodation as they hold good for young persons, do not apply to old ones as shown by the diagrams given by Donders himself, according to which in old people the increase of convergence is no longer followed by an adequate approximation of the near point. It is also a common experience that a presbyope may work at his near point without any inconvenience.

Landolt's conception could be understood, if, according to Tscherning's theory, accommodation were produced by active stretching of the fibers of Zinn in consequence of the contraction of the ciliary muscle, but not, as it is, by relaxation of those fibers. This allows the lens to become more convex as far as

its elasticity permits. That beyond this point which corresponds to the near point, a further contraction of the ciliary muscle is possible, is proved by the fact, first stated by Hess, that in an old person a strong effort of accommodation is not followed by an approximation of the near point, but by a drooping of the lens due to the fact that the relaxation of the fibers of Zinn exceeds the possible reduction in the circumference of the rigid lens. This is reached already with a very slight relaxation of the zonula, effected by only a small fraction of the entire power of the ciliary muscle. If the latter contracts beyond this fraction, the contraction would not manifest itself by a further increase of refractivity. Therefore according to this, accommodation may be viewed in two ways. We may see in it either the contraction of the ciliary muscle, or on the other hand, the effect of this contraction, *i.e.*, the change of refractivity. Only in this latter sense is accommodation accessible to measurement and may be called the manifest accommodation and its near point, the physical near point, it corresponds to what is usually called accommodation. Contrariwise, the accommodation considered as contraction of the ciliary muscle, may be termed physiological accommodation and the maximum of contraction the physiological near point. The physical near point coincides with the physiological in childhood and recedes from it gradually with the advance of age, so that more and more of the physiological accommodation becomes latent.

In the diagram representing the range of accommodation at different ages given by Donders, and later in a more accurate way by Duane, you notice, below, the nearly horizontal line indicating the position of the far point and, above, the line corresponding to the physical near point, approaching more and more the far point line so as to join it at the age of seventy. Now if you draw in this diagram a line corresponding to the physiological near point, it ought to begin at the starting point of the physical near point line and run from there pretty nearly horizontally, as the strength of the ciliary muscle remains presumably unchanged for many years and declines only in old age, when histological preparations show a slight reduction of the muscular bundles. The area between the two parallel lines, representing the far point and the physiological near

point is divided by the physical near point line into a lower half, corresponding to the manifest part and an upper half, corresponding to the latent part of the physiological range of accommodation, the latent part enlarging in the same measure as the manifest part diminishes. If this conception is right, as I believe, the manifest accommodation requires, excepting in childhood, only a part, constantly decreasing with age, of the total power of contraction of the ciliary muscle. This is evidenced by the experiments of Treutler. He applied a drop of a 2% solution of euphthalmine to the eye, which effects only a partial paralysis of the ciliary muscle. In the eyes of a youth of 11 years, it reduces the range of accommodation by 4 D., whereas it does not produce a retrocession of the near point in the eyes of a man of 38, because the latter requires for the adjustment to the near point only a part of the whole power of ciliary contraction, so that a slight paralysis of the ciliary muscle concerns only the latent part of the physiological range of accommodation.

If we concede, that with advancing age the manifest accommodation requires but a fraction of the possible ciliary contraction, the question arises, as to the amount of this fraction, in which respect two possibilities suggest themselves. The first is, that the amount of ciliary contraction keeps pace with the convergence. In young persons, when the increase of refractivity corresponds still more or less to the ciliary contraction, it is easy to state that the curve of accommodation and of convergence run a parallel curve. The relation between the two is not absolutely strict, but can be varied only within certain limits as Donders has proved by showing the existence of a relative range of accommodation, and of convergence. This limitation proves the intimate connection between accommodation and convergence which is probably like the connection between convergence and pupillary contraction, due to a corresponding connection between the nervous centers presiding over these functions. Hence we see, that if a change of refraction shifts the region of accommodation either from or to the eye, the stimulus to convergence does not easily comply with the altered condition. The greater amount of accommodation to which a hypermetropic eye is forced, is nearly always followed by an excess of convergence, esophoria or

convergent squint, and the same holds good as to the relation between myopia and exophoria or divergent squint. If the original connection between accommodation and convergence is nearly compulsory in youth, it is not likely that it should be given up in old age, when presbyopia is coming on. For this reason it seems probable that also in the presbyopic eye the physiological accommodation, *i.e.*, the contraction of the ciliary muscle, should correspond to the point of convergence and not to the point for which the eye is focused. According to this conception a man with a near point at 33*cm*, when working at this distance would converge for 33*cm* with an accommodation of 3 D., just as he did, when he was young. Some years later, his near point having receded to 100*cm* he would, when working at 33*cm* with the aid of a convex lens of 2 D, still make the same effort of his ciliary muscle as before, *i.e.*, 3 D. corresponding to the convergence, but of this physiological accommodation only 1 D. would become manifest, and 2 D. would remain latent. After the complete loss of physical accommodation, he would, when working with a 3 D. glass at 33*cm*, contract his ciliary muscle just as much as before but his physiological accommodation of 3 D. would now remain entirely latent. So the ciliary contraction with work done at 33*cm* would be the same, the whole life through and the change due to age would be only that after the onset of presbyopia more and more of this contraction becomes latent because inefficient. The entire power of ciliary contraction amounting probably to 15–20 D. and in very old age maybe not less than 10 D., a 3 D. physiological accommodation would always represent but a small part of the whole,—not enough to cause exhaustion. This conception permits us to consider Donders's law of the relative range of accommodation and its meaning as to prolonged work valid for all ages, if we determine the range of accommodation not according to the refractivity of the eye or the physical accommodation but according to the ciliary contraction or physiological accommodation. The curve of this may be assumed to run parallel with the curve of convergence throughout life, although there is no possibility of proving it.

The other assumption conceived by Donders, is that the presbyope contracts his ciliary muscle only as far as it is

efficient in increasing the refractivity, in other words, that the physiological accommodation always equals the physical. According to this an old man with an accommodation of 1 D., equal to a near point at 100*cm* and reading with a glass of +2 D. at 33*cm* would contract his ciliary muscle only corresponding to an accommodation of 1 D. With 70 years, after complete loss of accommodation the man would read with a +3 D. glass at 33*cm* without any contraction of his ciliary muscle. A man with a stiff elbow, who cannot bend his arm beyond a certain angle, would soon learn to contract the flexor muscles only up to that point. Likewise one might assume that the presbyope learns by experience to contract his ciliary muscle only as far as it is efficient, but contrariwise to the man with the stiff elbow, he would have to renew his experience constantly according to the progression of the rigidity of his lens. This theory would seem to be the commonsense one. But it supposes, that with the advance of age a constant change of the correlation between accommodation and convergence takes place. Now it has already been pointed out, that such a change, already difficult in youth, is still less likely in old age. Hence I believe to be the most probable assumption, that through the whole life the contraction of the ciliary muscle or the physiological accommodation keeps pace with the convergence, so that the presbyope does not require a special and constantly renewed adaptation to new conditions.

The above theory does not exclude the likelihood that in exceptional cases the desire to see near objects more distinctly, may induce a presbyope, especially in the beginning of presbyopia, to make an exaggerated effort of his ciliary muscle, not only inefficient, but even prejudicious to distinct vision. The troubles arising from such an excess of ciliary contraction are:

(1) Asthenopia. As a rule, the presbyopes do not suffer from asthenopia but there are exceptions to this rule. I remember patients, who in the onset of presbyopia did not complain of defective sight, but of headache and pain in the eyes after near work. As this asthenopia is relieved by proper convex glasses, it must be attributed to an excessive strain of the ciliary muscle as in hypermetropia. I imagine that such patients, not seeing distinctly any longer at their usual working distance, attempt to do so by an increase of ciliary con-

traction as they were previously accustomed to do, when, desirous of seeing small objects better, they brought them closer to the eye. But then they were also converging more, while now they make an effort to accommodate by an amount greater than corresponds to the convergence. It is probably this disproportion, which causes the discomfort, even if the absolute amount of the excessive ciliary contraction be small and not capable itself, of producing asthenopia. Young hypermetropes may suffer from asthenopia even with a total hypermetropia of not more than 2 D., too small an amount compared with their entire range of accommodation to effect asthenopia, so that I rather believe the latter is due to the fact, that these hypermetropes have not succeeded in adapting themselves sufficiently to the altered correlation between accommodation and convergence. If they do this, for instance by squinting, they are less subject to asthenopia than not squinting hypermetropes with the same degree of hypermetropia.

(2) Micropsia. There are rare instances, in which, in the onset of presbyopia, people do not complain of indistinct vision, but of seeing the print smaller and sometimes also more remote. Hess explains this by saying that the presbyope holds the book farther away and therefore gets smaller retinal images of the letters. But under normal conditions removing an object does not make it appear smaller, because, when interpreting our retinal images, we take the distance of the object unconsciously into account. It is only, if we are mistaken as to the distance of the object, that our estimation as to their size becomes erroneous. This occurs in cases of paresis of the ciliary muscle as well as in some cases of beginning presbyopia. In both cases the man strains his ciliary muscle in an amount greater than corresponds to the distance of the object and thinks it therefore nearer than it is, and as the retinal images did not enlarge correspondingly as he expected, he believes the objects to have become smaller.

In the presbyopic cases as a rule, the micropsia sets in only after having read for a while. Probably at first the excess of ciliary contraction is only slight, and as it proves to be inefficient, is gradually increased more and more.

(3) Protracted change of optical adjustment. After having looked for a while at near objects, for instance, after reading,

it may occur, that when looking at distant objects, a person requires some time, to see them distinctly. There are also very rare cases in which the contrary takes place, namely that after having looked at distant objects, the eyes adjust themselves to near objects only after a while. The delay in the adjustment from distant to near vision is sometimes also observed before the beginning of presbyopia, chiefly in cases of hypermetropia. I beg leave to report a few cases, in which the delay was unusually great. A man of 35, emmetropic and with vision $-\frac{5}{5}$, required after prolonged reading a glass of -1.5 D., to see distinctly at a distance and have $\frac{5}{5}$. A man of 57 with a myopia of 1 D. is still doing his work without spectacles and without discomfort, but returning home from his office, it takes a considerable time for him to see distinctly in the street with his glasses of -1 D. A man of 50, emmetropic, uses $+1.5$ D. for his work. After having read for at least one hour, he sees indistinctly at a distance and it requires sometimes another hour, until his distant vision becomes normal.

The delay of adjustment occurring chiefly in the onset of presbyopia and besides in hypermetropia, it would not do, to consider it as a symptom of some muscular or nervous disease, but rather as the consequence of the disturbed relation between convergence and accommodation. This needs no further explanation as to hypermetropic eyes. With respect to the presbyopic cases, we may also attribute it to the same trouble, the presbyope desirous of seeing near objects better, contracting his ciliary muscle more than corresponds to the distance of work, *i.e.*, to the convergence. It may then occur, that when now looking at distant objects, so that the convergence goes down to zero, the accommodation is relaxed only by the same amount, so that still some accommodation remains behind.

DIFFERENTIAL PUPILLOSCOPY.

By Dr. OTTO BARKAN, San Francisco.

(With one illustration on Text-Plate VI. and two in the text.)

DUE to the gross methods employed and to their subjective nature the examination of the pupillary reaction has up to the present been an eminently unsatisfactory one. This fact is reflected in the terminology used, the reaction being designated "normal," "present," "weak," "good," or "sluggish" according to the judgment of the individual observer. There has been no objective means of determining or measuring quantitatively the reaction or any criterion of what really constitutes a normal reaction. The so-called sluggish reaction has remained a source of trouble and annoyance to neurologist and ophthalmologist alike.

In the differential pupilloscope of C. v. Hess all sources of error have been eliminated and a very exact quantitative method inaugurated.

The original description of the method and results obtained therewith may be found in the publications of Hess and Groethuysen. In the following article the attempt has been made to present the abridged subject matter in as concise and amenable a form as possible. In doing this the writer has interpolated his own conclusions, based on the observation of over three hundred cases.

INSTRUMENT AND METHOD OF EXAMINATION.

The patient's eye is observed through a telescope of eight magnifications. Through tube A light is cast upon the eye. In front of this tube is a frame B consisting of an upper and a lower compartment, the upper, b, containing a grey glass of

known permeability to light. The lower, c, contains two grey prisms, gradated and calibrated, which can be made to slide upon one another by means of a micrometer screw (d). The prisms are most permeable to light at their apices and least at their bases so that the permeability of the system of prisms varies according as to whether the apices, bases, or intervening portions are superimposed. We can therefore by manipulating the micrometer screw obtain at will any desired intensity of light or conversely for any given position of the prism read off on a scale their position and therewith the amount of light passing through. For example a position of the prisms can be found at which their permeability will equal that of the constant grey glass. When this is the case the same amount of light will strike the eye irrespective of which compartment of the frame it is traversing, and by swinging these up and down the eye will be successively illuminated with lights of equal intensity. Consequently the pupil remains immobile since successive illumination with lights of equal intensity is the same as illumination with one constant light.

In practice and in order to obtain objective results we first proceed with differences of light sufficient to excite a marked reaction and then gradually diminish the light differences, by varying the positions of the prisms, until the least difference of successive light intensities is found which just suffices to elicit a pupillary reaction. In this manner we measure the *motor discriminative acuity* (M. D. A.) of the case in question. Physiologically this is the case when the difference of light intensities is as 95 to 100, or in other words, the *smallest differences of light intensities between which the normal pupil can discriminate is as 95 to 100.* This value is constant, is irrespective of the age of the individual, and is independent of the state of adaptation.

In practice the M. D. A. is not numerically designated by the actual differences of light but by a quotient (Q), which is obtained from it by a simple process of arithmetic. Physiologically Q = 0.9. The lowest limit of the physiological is 0.84. Diminution of Q to 0.84 is definitely pathological. *A pupillary lesion of such small degree is not detectible by any other method.* In fact I have seen cases in which Q was reduced to 0.6 and yet excellent clinical observers, using the

ILLUSTRATING DR. OTTO BARKAN'S ARTICLE ON "DIFFERENTIAL PUPILLOSCOPY."

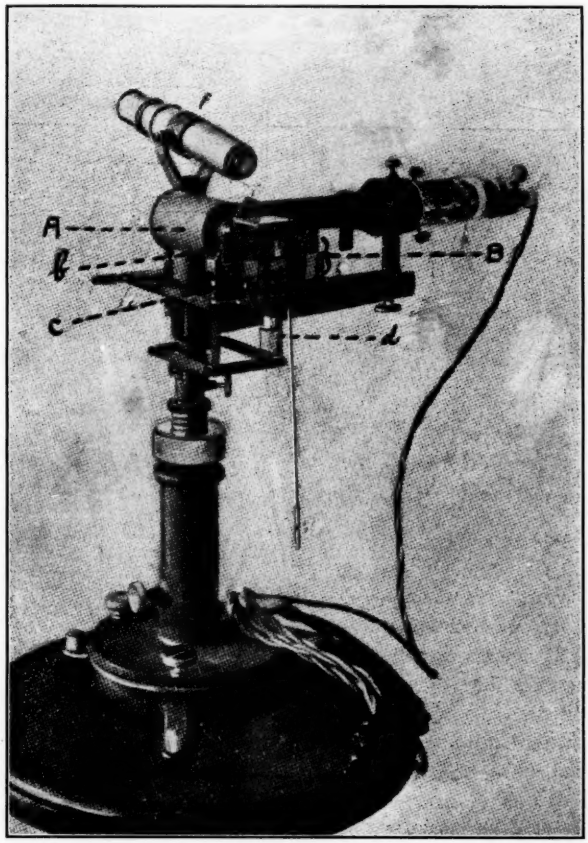

FIG. 1.

usual methods, were unable to detect any pathological change in the reaction. In this connection it is interesting to note that the consensual reaction is in normal cases exactly equal to the direct.

By proceeding similarly to the above we can further determine the *visual discriminative acuity* (V. D. A.) of the case. This is done by the subject stating which of the successive lights is the brighter. Under normal conditions the V. D. A. is found to exactly equal the M. D. A. That is *the smallest difference of light intensity between which the pupil can discriminate can also still be discriminated visually by the patient and vice versa.*

GENERAL FACTS REGARDING THE RELATIONS BETWEEN THE M. D. A. AND V. D. A. IN DISEASES OF THE VISUAL ORGAN.

A short review of the anatomical and physiological facts underlying the pupillary reaction may at this point prove helpful. It is well to bear in mind that the retina in its entire extent acts as receptor for impressions of light and therewith for the visual discriminative acuity. The pupillomotoric area of the retina, however, as shown by Hess, is in the main restricted to the fovea and a small circumfoveal area. Thus the pupillary response obtained by illuminating a peripheral part of the retina is due to diffusion of light to the foveal area. Consequently the M. D. A. is a function mainly of the foveal area and macular bundle of the optic nerve whereas the V. D. A. is a function of the entire retina and so also of the optic nerve in its entire diameter.

The pupillary reflex arc may be schematically represented as in Figure 2. Although the anatomy of this reflex is not yet definitely known, it seems certain that somewhere in the region of the corpora quadrigemina the pupillary fibers branch off from the optic tract, as at 4, to proceed to the third nerve nucleus. These fibers constitute a link between the afferent and efferent limbs of the arc and may in this sense be designated as the "intercalated," connecting or junctional portion of the arc. Lesion of this intercalated path is the anatomical substrate of the Argyll-Robertson pupil. Hess accordingly calls the Argyll-Robertson pupil a "schalt lesion" or "lesion of the intercalated path." The intimate nature of the tabetic lesion

of the "schaltung" does not concern us here. Bumke (3) discusses this point in full. Let it suffice that the schematic

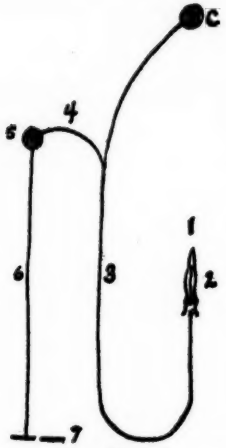

FIG. 2.

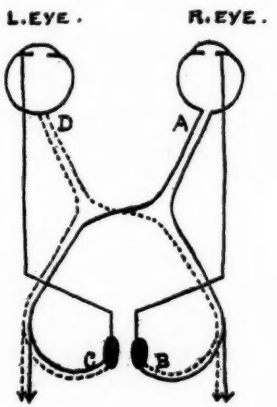

FIG. 3.

representation of the pupillary reflex arc in Figure 2 satisfies all results obtained with the pupilloscope.

1.	Dioptric apparatus.	Sensory portion of reflex arc.
2.	Optic receptor (retina).	
3.	Fibers (between the receptor and that point of the optic tract where the pupillary fibers branch off).	
4.	Intercalated portion (between the above mentioned point of the optic tract and the third nerve nucleus).	
5.	Nucleus.	Motor portion of reflex arc.
6.	Third nerve.	
7.	Ciliary muscle.	

Figure 2 shows in a general way how the motor and visual D. A. must be affected according to the situation of a lesion in the reflex arc.

1. In dioptric lesions (vitreous opacities, cataract, refractive errors), both M. and V. D. A. are normal.

2. Lesion of the sensory portion diminishes both acuities.

3. In lesion of the intercalated portion (Argyll-Robertson pupil), the M. D. A. is diminished while the V. D. A. remains intact.

4. In lesion of the motor portion the same obtains as in 3, and in addition the convergence reaction is impaired.

5. In lesions cortical to the point where the pupillary fibers branch off the M. D. A. is normal and the V. D. A. is impaired.

Without as yet calling upon the consensual reaction for diagnostic aid we may therefore provisionally classify lesions of different parts of the reflex arc as follows:

Lesion	*M. D. A.*	*V. D. A.*	*Convergence reaction*
1. In sensory path	diminished	diminished	normal
2. In intercalated path	diminished	normal	normal
3. In motor path	diminished	normal	diminished
4. Cortical	normal	diminished	normal

A very *valuable diagnostic aid* for differentiating between a lesion of the sensory portion (receptor or fiber lesion), and a lesion in other parts of the reflex arc is obtained by *comparing the direct with the consensual reaction.* This is rendered possible by the fact that the *pupilloscope gives exact numerical values for the consensual as well as for the direct reaction.* It is only by comparing the exact values of both that complicated affections of the reflex arc can be detected and localized. The following examples in conjunction with Figure 3 illustrate the importance of the consensual M. D. A. for localizing purposes. For the sake of clarity all nonessentials have been omitted from the diagram.

1. Suppose we find the M. D. A. of the R. Eye to be normal (0.9), and of the L. Eye to be 0.6. Then this diminution of the M. D. A. of the L. Eye may be the result of a lesion at D, (receptor or a fiber lesion), or of an intercalated lesion at C. In the former case the stimulus is partially blocked by an obstruction at D, the reduced stimulus being thereupon transmitted by the intact intercalated path (C), to the nucleus which in turn causes a pupillary contraction corresponding in degree to the intensity of the stimulus received. In the latter case, however (lesion of the intercalated path at C), the stimulus proceeds unimpeded until it meets with the obstruction at

C and its intensity is there reduced according to the amount of obstruction. In both cases the end result will be the same, namely, diminution of the M. D. A. of the L. Eye. By now measuring the consensual M. D. A. we are able to determine whether the lesion be at D or at C. If upon illuminating the R. Eye, for which Q = 0.9, we obtain the same value (0.9) for the consensual reaction of the L. Eye we know that C must be intact and the lesion must be at D. If on the other hand we find the consensual reaction of the L. Eye equals 0.6 (which is the same value as of the direct reaction of the L. Eye), then, since the path traversed by the stimulus to reach the nucleus includes besides the intact receptor and optic nerve of the R. Eye also the intercalated path of the L. side, C, the obstruction or lesion must be at C. The consensual reaction of the R. Eye on the other hand, being dependent upon a stimulus originating in the L. Eye and traversing B and D on its way to the nucleus of the R. side, will obviously not be affected by a lesion at C. If the lesion be at D, however, it will be diminished in the same degree as was the direct reaction of the L. pupil, (Q = 0.6).

Generalizing we may say that in the case of a lesion of the intercalated path (Argyll-Robertson pupil), the direct and consensual M. D. A. of the same eye are equal, whereas in the case of a receptor or fiber lesion the consensual M. D. A. of one eye is equal to the direct M. D. A. of the other eye.

For example let us suppose the M. D. A. of the R. Eye to be 0.4 and of the L. Eye 0.6. If this diminution from the normal of 0.9 is due to a lesion in the sensory portion (*e.g.*, optic nerve), the values for the consensual reaction will be as follows:

	R. E.	L. E.
Direct M. D. A.	0.4	0.6
Consensual M. D. A.	0.6	0.4

If, however, the above diminution of the M. D. A. is due to lesion of the intercalated path (Argyll-Robertson pupil), the values of the consensual reaction will be as follows:

	R. E.	L. E.
Direct M. D. A.	0.4	0.6
Consensual M. D. A.	0.4	0.6

The following example illustrates the results in a more complicated case in which the diminution of the pupillary reaction was due to two lesions, one situated in the sensory portion of the L. side and the other in the intercalated path of the R. side:

	R. E.	L. E.
Direct M. D. A.	0.4	0.4
Consens. M. D. A.	0.16	0.9 (normal).

The following are the results in a case in which two causal lesions were diagnosed and localized on the same side:

	R. E.	L. E.
Direct M. D. A.	0.2	0.9 (normal).
Consens. M. D. A.	0.4	0.5

Analysis of the above, which I must forego because of limited space, localizes one lesion in the sensory and the other in the intercalated path, both of the right side. In this particular case the diagnosis was optic atrophy with superimposed Argyll-Robertson pupil, both of the R. side.

More than three coincident lesions of the reflex arc can also be differentiated and localized.

GENERALIZATION OF RESULTS OBTAINED IN LESIONS OF THE REFLEX ARC ACCORDING TO THEIR SITUATION.

DIOPTRIC ERRORS.

In errors of refraction, opacities of the vitreous or lens, no matter how great the diminution of vision, the M. D. A. is the same as in the normal eye.

RECEPTOR LESIONS.

In accordance with what was stated above in regard to the foveal localization of the pupillomotoric area a centrally situated (macular) receptor lesion affects the M. D. A. more than the V. D. A. Moreover a central lesion will first of all affect visual acuity without necessarily affecting the M. D. A. provided that sufficient foveal elements remain to transmit the pupillomotoric impulse. If on the other hand we find the

M. D. A. affected by a receptor lesion we may conclude that vision must be diminished as well. ***This positive evidence when found in the case of cataract contra-indicates operation.***

For a detailed account of the various affections of the fundus and their influence on the two discriminative acuities I refer to Groethuysen (2).

FIBER LESION.

1. Optic Atrophy:

At the very beginning when vision is still 1.0 and the visual field shows no definite change the pupil is wider than one would expect and its contractions are smaller. The following case is characteristic for one-sided optic atrophy.

W. H., age 34. R. disk is a trace paler than left. Vision R. 1.0, and J_1 (not as clear as L.), L. 1.0 and J_1. R. visual field shows very slight concentric contraction. No scotoma.

Pupilloscope:	M. D. A.	V. D. A.
R. E.	0.9	0.9
L. E.	0.9	0.9

On direct illumination the R. pupil is wider than the left and its contractions are smaller than on the L. side.

Diminution of the M. D. A. does not, however, occur until vision has been reduced to 0.3 and the visual field impaired. ***Diminution of the M. and V. D. A. runs parallel through all stages of optic atrophy*** from the beginning until amaurosis and immobility of the pupil. This fact is of great importance for the differential diagnosis and analysis of a diminution of the M. D. A. caused by optic atrophy with coincident lesion of the intercalated portion. That is to say ***we can in the presence of any degree of optic atrophy diagnose an Argyll-Robertson pupil*** and even express numerically the respective part played by each process in causing the diminution of the pupil reaction. The combination of optic atrophy and Argyll-Robertson pupil is frequent.

2. Retrobulbar Neuritis and Papillitis.

In acute retrobulbar neuritis both acuities are diminished to an equal extent. In the chronic form if the macular bundle is

selectively affected the M. D. A. is diminished more than the V. D. A. It is of interest to note that ***papillitis, which affects the M. D. A., gives a bad prognosis.***

LESION OF THE INTERCALATED PORTION.

(Argyll-Robertson pupil or reflex iridoplegia)

In this case visual acuity and V. D. A. are normal whereas M. D. A. is diminished in proportion to the degree of the lesion. Convergence reaction is intact. In addition to the above simple relations one finds that the contractions of the sphincter are not equal in all parts of the pupil. In fact different values of M. D. A. are often obtained for different parts of the sphincter until, as the disease progresses the M. D. A. of the entire sphincter is impaired. Such pupils show deformity and this finding alone is evidence in favor of an Argyll-Robertson pupil.

As illustrations the following cases may be cited:

CASE 1.—K. K., age 47, suspected metalues. V = 1.0 and J_1. Fundus: n.

Pupilloscope:	R. E.	L. E.
Direct M. D. A.	0.91	0.86
Cons. M. D. A.	0.91	0.86
Visual D. A.	0.91	0.91

Convergence reaction present. Pupils; R., round; L., slightly deformed nasally; the contractions here are smaller than in the other parts.

This case illustrates the typical beginning of an Argyll-Robertson pupil.

CASE 2.—M. B., age 53. In clinical treatment for epileptiform fits. V = 1.0 and J_1. Fundus: n.

Pupilloscope:	R. E.	L. E.
Direct M. D. A.	0.24	0.56
Cons. M. D. A.	0.24	0.56
Visual D. A.	0.91	0.91

Convergence reaction present. Both pupils irregularly deformed, the sphincter contractions being slightly different in different parts of pupil.

In these cases the speed of the pupillary contraction may be normal and is by no means always "sluggish." For this reason Hess has dropped the term "sluggish" in cases of reflex iridoplegia. The essential nature of the change constituting what is termed the Argyll-Robertson pupil (reflex iridoplegia), is a diminution of the M. D. A. *An Argyll-Robertson pupil can be detected at a much earlier stage than has hitherto been the case. For the early diagnosis of tabes in particular Hess's method of determining the M. D. A. has proved of the greatest importance.*

LESION OF THE MOTOR PORTION.

Here the relations of the M. and V. D. A. are the same as in the above case but in addition the convergence reaction is impaired. In practice this lesion is difficult to differentiate in its very beginning from an early Argyll-Robertson because we possess no exact method of measuring the convergence reaction analogous to the above method of measuring the light reaction. As, however, the ætiology is in most cases the same for both of these lesions (for absolute iridoplegia lues or metalues; for the Argyll-Robertson pupil always metalues), this want is in such cases of no great import.

CONCLUSIONS.

The differential pupilloscope is of particular value for the early diagnosis of tabes. An Argyll-Robertson pupil can be definitely diagnosed at a time when to our present method the pupil reaction appears quite normal. In view of the fact that pupillary changes often appear many years in advance of all other metaluetic symptoms the importance of an early diagnosis is evident from a therapeutic point of view. Moreover the diagnosis of such a pupillary lesion can be made irrespective of coincident optic atrophy, opacities of the media or even of synechiae so long as in the latter case a portion of the pupil is not mechanically impeded in its freedom of movement.

As there exists a physiological standard for the reactivity of the pupil which is independent of the age of the individual and as the reactivity of the pupil can be measured with mathematical accuracy and be numerically expressed we are able in

any given case such as anisocoria, deformed pupils, etc., to determine with certitude whether the anomaly in question is pathological or not. If the former is the case the lesion can in most cases be localized as well.

The method is a very useful adjunct for the detection of simulation or aggravation. In some of these cases it proves to be a decisive diagnostic factor.

It is also of aid in the early diagnosis of optic atrophy. Moreover, it affords an objective method of measuring the color sense. Hess has shown that the reactivity of the pupil shows characteristic values for different colors.

Since the reactivity of the pupil is not affected by opacities of the media the method retains its full diagnostic value in the presence of cataract, opacities of the vitreous, etc. It may in some cases of cataract in which, according to our present methods conditions seem normal, contra indicate operation or indicate the giving of a very guarded operative prognosis.

The differential pupilloscope measures the motor and visual discriminative acuities. In order to avoid these newly coined terms and for the sake of facility of comprehension I have in the above conclusions deemed it advisable to use the expression "reactivity of the pupil" in their stead and wish, in order to avoid possible misinterpretation to call attention to this fact.

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EARLY CATARACT (SENILE), PTOSIS, AND AFTER-CATARACT.

By Colonel HENRY SMITH, I.M.S. (Retired) London, Eng.

EARLY CATARACT: Our knowledge of the causation of early cataract is hardly even in the stage of theory. Not one of the few theories advanced will stand the test of facts. How could it be otherwise? We know nothing of the nutrition of the lens or of the elimination of its waste in health.

Pathological anatomy up to the present time does not bear on this issue.

Its extreme prevalence in certain localities—the Plains of North West India—does not help us much. Its relative absence in other parts of India helps us equally little. Where it does prevail, the diet is chiefly wheat, maize, and peas with fats. Where it does not prevail to the same extent as in the Himalayas, Bengal, Burmah, etc., the chief articles of diet are rice, maize, and peas. You would thus be disposed to say that wheat, as the predominating article of food, had something to do with it. We must be cautious about a theory such as this. Except in Burmah the people belong to the Aryan race chiefly so that there is no racial element in the matter. It is clearly not a starvation disease in the ordinary sense of the term, as, of the areas most affected, the peasantry are physically the finest in the Indian Empire, and there is no question of malnutrition or starvation amongst them, viz., in the Panjab.

Undue exposure to glare (actinic rays) has been advanced as a causation but this influence again is as great in the non-cataractous areas as in the cataractous areas.

The earliest symptom of senile cataract is ***failing distant vision***. I think I was the first to advance this observation.

The patient's near vision with spectacles is good for ordinary purposes when his distant vision is reduced to less than one half. This is a very noticeable fact to anyone in the Panjab who examines railway employees once a year. These men require vision of $\frac{6}{6}$; normal vision is much better than this. When distant vision falls to $\frac{6}{9} - \frac{6}{10}$, or even $\frac{6}{12}$ you may observe nothing in the lens further than that it does not transmit light as well as a normal lens. You observe this fact by having a normal case on one stool and one of these cases on another—and on examining the eye of both including the retina with an ophthalmoscope with the same light. You observe how clear every structure is in the normal cases and that at the same time you make out with equal ease the structure of the retina in the early cataract case. The retina appears in the one as if you were examining with a good light and in the other with a poor light, though it is the same light in both cases. In these early cases you occasionally see the appearance of black sand, like particles in the periphery of the lens. In other cases you may see a few opaque striæ making their way from the periphery towards the center. The center in either case usually remaining clear. These appearances are unusual before vision has been reduced below $\frac{6}{10}$.

In people below thirty the appearance of small oil droplets take the place of the above-mentioned appearances.

It is evident to anyone that the old description of cataract as mature and immature are only referring to the later stages of the disease. It is evident that there must be an earlier stage and that cataract does not develop all at once. As regards the treatment of the early stage of cataract: Many years ago I had an Anglo-Indian patient, about 50 years of age. She had a very slight nebula on the center of the cornea of each eye due to a recent ophthalmia. I saw with the ophthalmoscope that she was suffering from the early stage of cataract in addition. She told me that her vision had become useless for anything distant or anything fine. I gave her a subconjunctival injection of cyanide of mercury in each eye which I believed would clear up her corneal nebulæ. I told her to write and let me know a few weeks later how the vision fared both for near and distant. She told me her vision had recovered to be as good as ever it was, both near and distant. It struck me on thinking

over the case that this was impossible unless on the understanding that the hyperæmia (which I had induced) had also influenced the nutrition of the lens.

In the railway people and others who came before me I had plenty of early cataracts and proceeded to treat them on the same lines and was agreeably surprised to find that the same treatment was equally successful. I tried them at different stages and found that up to $\frac{6}{10}$ we might expect to be successful in almost every case. Even $\frac{6}{12}$ will recover to $\frac{6}{6}$. But while the result in $\frac{6}{10}$ and less lasts for years $\frac{6}{12}$ or more has a tendency to recur. I do not wish you for a moment to think that dead tissue such as sandlike opacities or minute opaque slitæ, when present, disappear. I have had many such cases under observation for years and am satisfied that such treatment is eminently satisfactory both for the surgeon and for the patient. As regards the future of this question, the general practitioner has to be educated to recognise that *failing distant vision in people over forty* is the first sign of cataract and that it is his duty then to send the patient to an ophthalmologist for investigation. If this were done in every case it seems to me that operations for senile cataract will in the future become less frequently necessary and that it will be found that the early stage of cataract will be found to be more frequent over 50 years of age than is probably supposed.

Since my first paper on this subject I am aware that eye baths containing iodide of potassium and other agents have been tried over long periods with success. I have tried iodide of potassium subconjunctivally and find that from 15 to 18 grs. to the ounce give an efficient hyperæmia, the results of which are about the same as those obtained from cyanide of mercury. It seems to me that no matter what the agent used is the result does not depend on the agent but on the hyperæmia.

From my observation of malingerers it seems to me that drops of a nicotine solution would be as efficient as any for inducing hyperæmia.

Since my first paper on this subject I am aware that a number of men have tried this treatment and have not been so successful. I would here issue a warning note, viz., that care has to be taken in the diagnosis as failing distant vision follows

from other conditions than cataract. Through what mechanism does this treatment affect the nutrition of the lens or the elimination of its waste or both? Such results as these can only be accomplished in one or both of these ways. If we assume that it is a merely atheromatous contraction of the channels conveying the nutrition of the lens which is the cause of the cataract, we would not expect results such as we have lasting for many years from the mere dilation of these channels resulting from a hyperæmia which lasts for only a few weeks. We would expect the atheromatous condition to recur rapidly as it does in other structures. It seems to me, that, to explain these facts, we must assume that a special pabulum for the nutrition of the lens is metabolized by some of the cells in the ciliary region and that the cause of cataract is that these cells have assumed a pathological condition and issue a pabulum which is not physiological and not fit to maintain the physiological nutrition of the lens. The result of the treatment would imply that the hyperæmia induced re-establishes the physiological condition of the metabolizing mechanism. I think the existence of such a mechanism will not be disputed.

This of course is speculation, but speculation with facts behind it. The influence of a hyperæmia in other regions of the body are beyond the domain of doubt. Similarly the influence of local blood letting which is very closely allied to that of artificial hyperæmia.

The influence of local blood letting over a painful acutely congested liver is very marked. I have explored with a trocar a large and painful liver for abscess a number of times and failed to find one. The result was the escape of four to five ounces of blood and I was agreeably surprised next day to find that the patient was relieved of all his trouble and continued to be so.

This question of cataract opens up a wide field for the physiologist and I hope that physiologists will devote more attention to the nutrition of the lens and the vitreous than they have done in the past.

Ptosis: I need not dwell on the large number of operations devised for the treatment of ptosis which are familiar to you all further than to say that the largeness of the number and the fact that very few operators are satisfied with the same opera-

tion are indications that not one of them is satisfactory. In my personal experience such is the case.

In India the indigenous ophthalmological quack does an operation for trichiasis and entropion which very frequently suspends the upper lid high enough for the requirements of ptosis. He simply excises a large portion of skin from the upper eyelid and stitches it up. It struck me that a modification of this proceeding would be efficient for ptosis.

Rhinoplasty, as we do it in India is the indigenous quack surgeon's method modified and put on a scientific basis. It is hitherto undoubtedly superior to any other rhinoplastic proceeding devised, we should not be above taking a lesson from anyone.

The following modification I have tried frequently and I am satisfied that it is simpler, more efficient, and leaves less scarring than in any of the other operations.

I remove an ellipsoidal piece of skin the whole length of the eyelid, a little larger than we remove in entropion operations. The lower part of the excision runs close to the eyelashes. I now proceed with a dissector and a pair of dissecting forceps to separate the orbicularis muscle from the tarsal cartilage and the anterior part of the fornix from end to end and I continue the separation upwards and forwards till I reach the periosteum at the front margin of the orbit. I now pass in four stitches, one at each end and two between, through the eyebrow and underneath the orbicularis and lift the anterior portion of the fornix on the needles. I now spit the tarsal cartilage with each needle bringing it out in front of the eyelashes and tie the stitches over a small roll of bandage material. The stitches are taken over at the end of eight or ten days. I think, gentlemen, that you will find that this procedure is more satisfactory than any of the other operations so far devised. It is also very simple to perform. The principle involved is plain. It not merely suspends the eyelid mechanically, but brings the frontalis muscle to bear on it freely without paralysing in any way the orbicularis muscle.

AFTER-CATARACT:[1] The subject I propose to bring forward for discussion is the treatment of after-cataract. For the mild-

[1] Read at meeting of American Ophthalmological Society, Swampscott, June, 1921.

est form of after-cataract needling is generally recognized to be efficient. There are many needling methods advanced with very little to choose between them. In skilful hands any one of them seems as good as another. It is the more severe forms of after-cataract with which I propose to deal to-day. We are all familiar with the fact that needling is not satisfactory in the case of dense after-cataract. In these cases the iris is considerably tied down to the after-cataract. When an opening is made in them with needles they have a very great tendency to resent our interference by flaring up with a violent inflammatory reaction. In any case they generally require to be needled several times before a permanent opening is secured. After each needling the opening we make tends to close up again. The inflammatory reaction which is very liable to follow in severe cases often results in the destruction of the eye. Needling in any case (mild or severe) is not the very innocent proceeding which many would have us believe. In the last decade of the last century and in the early years of this century needling was regarded as serious an operation as extraction of cataract. The same methods and the same precautions were taken then as are taken now. The trouble in my opinion is not due to direct sepsis; there are more evils in the world than sepsis. The more the iris is tied to the after-cataract by inflammatory adhesion, the greater is the inflammatory reaction following needling. The most severe form in after-cataract according to my observation follows the extraction of immature cataract by the capsulotomy method and follows the needling of the jelly-like type of cataract which we often find in children and growing people. This stringy jelly-like material does not seem to be absorbed after needling. I have come across cases in children and adults operated on by the above two methods with very dense after-cataracts, with the pupillary margin tied down all round to the after-cataract. These cases had had a long course of after-treatment and when leaving had been told that nothing further could be done and that the prospect of vision was hopeless.

Many of them had been operated on by highly skilled operators. These experienced operators had properly come to the conclusion that any needling interference would cause such an inflammatory flare-up as would in a few days utterly de-

stroy the eye. These patients or their people were usually intelligent and often came from very long distances. The unintelligent would have accepted the verdict that there was nothing more to be done, they were prepared to take risks as they had no other prospect but to remain blind. In these cases there is always a posterior chamber. I do not interfere with them till all inflammatory reaction has settled down. I put them under the influence of a grain of blue pill four times a day and continue for a few days after operation, in order to anticipate any further reaction induced by my interference. I atropinize them heavily before operation. I make a liberal sized iridectomy incision in the sclero-cornea so as to open up the posterior chamber. I do an iridectomy if one has not previously been done. If one has been done already my wound is over one of the pillars of the coloboma, so that I can get a piece out of the iris there and thus open up the posterior chamber. I now insert a curved, small dissector into the posterior chamber and separate the iris from the after-cataract all round. This is not a difficult matter as such adhesions are much less strong than the uninitiated would expect. This interference is associated with free bleeding from the iris which must be squeezed out repeatedly until it has ceased. It will now be observed that the atropine previously instilled has dilated the pupil; at this stage I reach in a good iris forceps to below the equator, allow its points to dilate widely, and press them into the after-cataract and fetch the whole after-cataract out with the forceps. If any pain follows within the next few days, I apply half a dozen leeches to the temples. There is no procedure in surgery with which I am more satisfied than this one and none more surprising to the patient. The results are eminently satisfactory, the pupil is again mobile, and the vision good. There was no one more astonished than myself in my first cases to see that this intervention was associated with little or no inflammatory reaction. In my opinion in the relatively milder types of after-cataract the same proceeding should be adopted. The attachments of the iris to the after-cataract if not released as in the needling methods are the cause of the inflammatory flare-up which is often so destructive.

DISCUSSION ON THE DIAGNOSIS AND TREATMENT OF CONGENITAL SYPHILIS.[1]

ABSTRACTED FROM THE "PROCEEDINGS" OF THE ROYAL SOCIETY OF MEDICINE BY Mr. P. G. DOYNE, LONDON.

SIR HUMPHREY ROLLESTON in opening the discussion said that he would confine his remarks almost entirely to diagnosis and would suggest the following points for consideration:

1. The limits of the Wassermann reaction as a means of diagnosis.

2. The influence of congenital syphilis:

a. In favoring the onset of other infections.

b. In leading to changes in the endocrine glands and so indirectly to syndromes which were not necessarily specific.

c. In relation to diseases or syndromes which were not generally regarded as due to syphilis and were not obviously secondary to lesions of the endocrine glands.

1. Except at birth, when a positive Wassermann reaction did not necessarily mean the presence of syphilis, a positive Wassermann reaction indicated the presence of living spirochætes and the need for anti-specific treatment. The converse did not hold good however. The reaction might be negative for several weeks in a newly-born infant and then become positive. At puberty the reaction often became negative though spirochætes were still present. He threw doubts on the value of the "provocative dose" of salvarsan and mentions observations in definitely non-specific cases in which an intravenous injection of salvarsan produced a positive reaction. In some cases the present symptoms would be due to damage to an organ by syphilis in the past, and the question

[1] Held at the Section for Study of Disease of Children, Royal Society of Medicine, London.

would arise as to whether, in the face of a negative reaction, anti-specific treatment was necessary. He especially referred to insufficiency of the endocrine glands and the blood forming organs in this connection. At the present moment it appeared to be impossible to accept as absolute the proposition that, in the presence of syphilitic stigmata, a negative reaction of the blood eliminated the possibility of existing syphilitic infection. The Wassermann reaction might be positive in the cerebro-spinal fluid and negative in the blood. This might especially be the case in syphilitic disease of the pituitary and in pituitary dystrophies the true ætiology of the condition might be missed if the reaction of the blood only was taken. But even in the absence of syphilitic stigmata and with a negative reaction could syphilis be absolutely ruled out when no other history or sign of past infection or any other kind of infection could be found?

It should always be borne in mind that apart from the specific effect anti-syphilitic drugs had a beneficial effect upon the body and upon the endocrine glands and blood forming organs in particular.

2. **Congenital syphilis as a predisposing factor to other infections.** It was important to bear this factor in mind as otherwise the acute exciting factor might put into the shade this underlying factor. Acute infections of the liver and hemorrhagic diseases of newborn infants are to be considered in this connection. Also syphilis, by reducing resistance, paves the way for secondary infections of chronic character, for example tubercle of lymphatic glands in a syphilitic subject.

The influence of syphilis in leading to lesions of the endocrine glands and so conducing to syndromes which were not necessarily syphilitic.

The adrenals, pituitary, and the testes were the endocrine glands most often affected in congenital syphilis. As regards the testes Sir Frederick Mott had suggested that a chronic spirochætal intoxication might depress their vital energy. Infantilism was common in congenital syphilis. Addison's disease and myxœdema were uncommon in congenital syphilitic children, but slighter degrees of insufficiency were common. A certain proportion of cases of pluri-glandular insufficiency causing diabetes and infantilism were probably due to congeni-

tal syphilis. Again in obesity of endocrine origin congenital syphilis played its part.

The influence of congenital syphilis in relation to various diseases which were not generally regarded as due to syphilis and were not obviously due to lesions of the endocrine glands. (Chronic interstitial nephritis in early life.) Congenital syphilis might be a factor in producing chronic interstitial nephritis in several ways. The diffuse small-celled infiltration might either advance to fibrosis or disappear leaving behind a diminished resistance which would make the organ a prey to other factors which could produce the change. The widespread arterial change might produce an arterio-sclerotic kidney. By damaging the endocrine organs the resulting metabolic disturbance might subsequently lead to kidney changes. This might have a bearing on those cases of renal dwarfism in which the Wassermann reaction was negative. In portal cirrhosis there were cases which showed the stigmata of congenital syphilis. Chronic pericolitis with adhesions and peri-enteritis causing chronic abdominal symptoms had been considered in part a late result of congenital syphilis. Syphilis was a potent cause of anæmia in early life, but should be regarded as only one of the factors of infantile anæmia. Mitral stenosis had been thought to be a malformation due to the influence of congenital syphilis. In Great Britain congenital syphilis had not been accepted as a cause of rickets but indirectly by its influence on the endocrine glands might modify nutrition. Regarding malformations, the question arose as to how far the intrauterine activity of congenital syphilis was a cause of these defects. It was certainly not the exclusive cause but it was possible that in this country it had been underestimated as a factor.

Mr. O. L. Addison dealing with the surgical aspect of congenital syphilis took into consideration two age periods (I) infancy (II) after infancy. (I) With the exception of "snuffles," osteomyelitis of the long bones was the one common surgical lesion. It was most often seen at the age of three months and affected all the long bones of the arms and legs, the condition being generally more advanced in the arms. X-rays and the age of the patient afforded a ready means of diagnosis. The X-ray photographs were characteristic show-

ing the periosteum raised up from the shaft by a deposit of new bone and large areas of absorption, most marked at the ends of the diaphyses. The name "epiphysitis" for the more advanced cases was misleading as the changes were most marked at the ends of the diaphyses. He had not seen syphilitic arthritis in infants unassociated with osteomyelitis. Cases of renal insufficiency associated with multiple fractures showed X-ray appearances not unlike late quiescent cases of syphilitic osteomyelitis but the presence of albumen in the urine and a negative Wassermann revealed the correct diagnosis. Next in order of frequency came Orchitis. Common at birth or in the first month, it occurred as a hard painless enlargement usually symmetrical and accompanied by a small hydrocele.

(II) In the "after infancy period" bone and joint affections were the most frequent manifestations. Periostitis occurred at 3–4 years or later and was diffuse or localised, the former giving rise to the "saber" tibia and latter to nodes. Both were commonest on the tibia. General osteomyelitis was less common. It gave rise to a great increase in amount and thickness of the compact bone with areas of softening and with the formation of sequestra in the medulla. Regarding the joints, gummatous synovitis was common and was difficult to diagnose from tubercle. The more rapid recovery of movement after the removal of splints and the greater overgrowth of bone were distinguishing features. Symmetrical serous effusions, usually affecting the knee-joints, were common but chondro-arthritis was rare. Rarer affections, occurring at this age, consisted in gummata in muscles skin and subcutaneous tissues, ulceration of the palate and chronic enlargement of the glands of the neck.

Regarding diagnosis, he pointed out the great difficulty, in the absence of cardinal signs of congenital syphilis, in differentiating many of the lesions from tubercle and advised the performance of a Wassermann reaction as a routine measure.

Sir Frederick Mott dealt with Juvenile General Paralysis and Tabo-paralysis. He was convinced that syphilis was the cause of it. Of the cases of juvenile general paralysis which he had collected, about half showed signs of congenital syphilis, and a specific family history was discovered in the majority of cases. He had examined the testes in these cases, and

found that they had the appearance of the testes at birth except that the interstitial cells of Leydig were absent. This absence probably was related to the infantilism which occurs in these cases. In some histories of cases of juvenile paralysis of the insane, miscarriages, abortions, and deaths in the earlier pregnancies were followed by juvenile paralysis of the insane occurring at puberty, in the later born children and this suggested an attenuation of the virulence of the spirochæte by the action of antibodies in the mother.

Dr. Leonard Findlay (Glasgow) emphasized the value of the Wassermann reaction as carried out in the original technique in the diagnosis of congenital syphilis. He produced figures in which the results of the Wassermann reaction were compared with the clinical diagnosis, and showed that they were in striking agreement. The condition of marasmus was often said to be not infrequently the manifestation of syphilis. He did not consider that there was any adequate evidence for this view.

He had the impression that congenital syphilis was not so common as was generally thought. He did not think that examination of the umbilical blood was a certain test, and he was favorably impressed with the ante-natal treatment of the syphilitic mother, when such treatment was instituted before the ninth month of the pregnancy. He considered that a negative Wassermann reaction statistically meant freedom from the disease, but he did not assert that a negative reaction and complete destruction of spirochætes were synonymous. Treatment by mercury alone stood condemned, but with the advent of salvarsan and its application along with mercury a great reduction in the mortality rate was obtained.

Dr. David Nabarro said that his experience was gained at the Children's Hospital, Great Ormonde Street, and he was fortunate in that he took the blood, did the Wassermann test, and treated the cases. He was at the present time using neokharsivan, giving intravenous injections into the arm or external jugular vein, or intramuscular injections if a suitable vein were not forthcoming. He used simple watery solutions of the drug for both kinds of injections. For infants under one year of age he used an initial dose of 0.5 grm., increasing to 0.15 grm., and for larger children, 0.1 grm. to 0.45 grm. The

course consisted of 6 weekly injections with simultaneous mercurial inunctions. The condition was checked by Wassermann tests and the course repeated if necessary. He had great faith in the Wassermann reaction when reliably done. It must be remembered that a positive Wassermann reaction did not prove that a particular lesion was syphilitic. A negative reaction did not preclude syphilis. Very young children might give a negative reaction, so that he always tried to test the mother's blood. The mother's blood was nearly always positive when the child's was positive, but often the father's was negative. Congenital syphilitic children were undoubtedly benefited by treatment (arsenic and mercury) but it was too early to say that they were cured. In congenital syphilis it was difficult to make the Wassermann reaction negative. In 62 treated cases the Wassermann reaction had become negative in only 14, and in 5 of these it had since become positive again. He strongly urged ante-natal treatment.

Dr. Amand Routh. The infantile deaths of syphilitic children occur chiefly at two periods. (1) During the first week or two after birth. (2) Later on in the first year, when congenital syphilitics, born apparently healthy, became clinically syphilitic. He urged early treatment of the syphilitic mother, not only during her pregnancy but until cured. He referred to the condition of latent syphilis in pregnancy, due to the action of the syncytial toxins upon the spirochæte. The child might be born apparently healthy, but as the syncytial toxins disappeared from the tissues after birth, the spirochæte would develop. In a few cases the syncytial toxins might completely destroy the spirochæte, thus accounting for the occasional birth of a healthy child amidst a series of still births or infected children.

Mr. Bishop Harman produced statistics from the London schools for the blind and partially blind. He divided the cases according as the major effects of the syphilitic changes affected (1) the anterior parts of the eye, (2) the posterior. Often, of course, inflammatory effects were found in both areas, but the division, though arbitrary, was interesting. In making this classification confirmatory clinical signs of congenital syphilis were noted. It was interesting to observe that the most serious general symptoms were found in those cases in

which the disease, as far as the eye was concerned, was most marked in the posterior parts of the eye. This was especially marked among the mentally defective children. Though children, subjects of interstitial keratitis, were often dull and backward, no cases definitely returned as mentally defective were among this group. The reverse was the case with children who had disseminated choroiditis.

Dr. Morley Fletcher had the impression that the type of the disease seen in infants was changing. Infants with frank manifestations of syphilis were less often seen. This might be accounted by (1) that the infection was of milder type, (2) that resistance to infection was gradually increasing.

He felt that the Wassermann reaction, performed by competent pathologists, was of great value, though it was to be understood that a negative Wassermann reaction the result of treatment, did not necessarily mean that the disease had died out. Regarding the value of the provocative dose, he had not seen a single case where a positive reaction had followed a provocative infection. Resistance to infection was lowered in syphilitic children. There was a close association between syphilis and tubercle and cases of tubercle occurring in congenital syphilis were much benefited by antisyphilitic treatment. He would emphasize the possibility of lowered efficiency of the endocrine glands caused by previous syphilitic disease in them, and would draw attention to the important relationship which congenital syphilis might bear to kidney disease. It would be interesting to know what proportion of cases of fibrosis of the lung gave a positive Wassermann reaction.

Regarding treatment, it was generally agreed that intravenous injections of arsenical compounds combined with mercury was the method of choice. But he would point out how tolerant of mercury children were, and he did not think that the best results were obtained unless large doses were given.

Mr. John Adams urged the ante-natal and immediate post-natal treatment of syphilis. In children the effect of salvarsan was remarkably rapid. He mentioned the case of a woman, 7 months pregnant, who became infected with syphilis. She had no treatment and developed generalised syphilis at full term. The child born gave a negative Wassermann reaction.

For the sake of information he was watched and not treated. The Wassermann reaction remained negative. He would account for this by the action of the syncytial toxins mentioned by Dr. Routh. The reason why congenital syphilis was a comparatively rare disease was because 50% of all syphilitic fœtuses were born dead and 75% of those born alive died within the year.

Dr. Jewsbury produced statistics from the children's department of St. Thomas's Hospital.

With regard to the incidences of the disease in families as it affected children born of syphilitic parents. In about 50% the disease was most marked in the earlier pregnancies, becoming attenuated later on. But in the other 50% children apparently free cropped up irregularly amongst definitely syphilitic children. He mentioned a case of twins, 5th and 6th in the family, of whom one was obviously syphilitic with positive Wassermann reaction, and the other showed no sign of syphilis and the Wassermann reaction was repeatedly negative up to 6 years of age. A few children of syphilitic mothers who had not been treated were free from signs and had a negative Wassermann reaction; many children had shown the usual signs of congenital syphilis in whom rash and snuffles appeared 2–8 weeks after birth. In certain numbers of children symptoms developed late, after the 3d or 6th year. He had found the Wassermann a reliable test.

Mr. J. E. R. McDonagh. If a woman contracted syphilis while pregnant, up to the end of the 5th month, the child would be syphilitic. During the 6th and 7th months 50% of the children would be syphilitic, but during the 8th and 9th months the child would probably escape.

If a woman contracted syphilis before being pregnant, non-syphilitic children were most likely to occur in the middle of the family. Such a woman should, however, be treated throughout the whole of each successive pregnancy, irrespective of the amount of treatment she had already undergone.

If the mother underwent treatment during the whole term, the children would be born healthy, but, in his experience, even these children were liable to develop the later forms of the disease.

A negative Wassermann reaction could not be held as signi-

fying that the child was not syphilitic, and as against this a positive Wassermann reaction, given by a child at birth, was not proof positive that the child was syphilitic if the mother had not contracted the disease until the 8th month of the pregnancy.

He thought that in the future less early congenital syphilis, but more late congenital syphilis, would be seen, especially of the nervous system.

MR. NOAME and MR. WOODHEAD described the results of the treatment of 38 consecutive cases of interstitial keratitis. Only those cases who showed the presence of deep vessels in the cornea, and who had had a positive Wassermann reaction on one or more occasions since the onset of the disease, were accepted as interstitial keratitis. Treatment consisted of courses of intravenous injections of novarsenobillon or disarsonol, mercury by the mouth and atropine to the eye.

Of the 38 cases, 24 had only reached the stage in which visual acuity could be examined. Of these 24 only 5 had vision worse than $\frac{6}{36}$. In 7 cases the disease started in the second eye during and after the use of arsenic injections.

In conclusion they doubted whether arsenic combined with mercury could prevent the second eye from becoming affected. They thought this treatment had a definitely beneficial effect on the choroid and on the corneal condition when the disease was established.

MR. A. T. PITTS. The teeth which show characteristic modifications in congenital syphilis were the upper central incisors (Hutchinson's teeth) and the first permanent molars (Moon's molars).

The notching of the central incisors would seem to be a true hypoplasia due to some interference with the calcium metabolism and was comparable with the hypoplasia of rickets. It must be remembered when using the notch as a diagnostic point, that at times it was absent, and reliance should be placed chiefly on the narrowing of the cutting edge. The first molars showed a diminution in breadth towards the masticating surface and the cusps were stunted and rounded. Regarding the milk dentition, it was doubtful whether there was any condition of these teeth which could be called pathognomonic of congenital syphilis. It must be remembered

that the calcification of the deciduous incisors began at the 16th–18th week of intra-uterine life. Syphilis attacking the fœtus at this early stage would be likely to cause its death. However hypoplasia of the milk teeth was most probably associated with congenital syphilis which interfered with the calcium metabolism.

Dr. Ronald Carter said that his impression was that congenital syphilis was a comparatively rare disease. He mentioned figures from one of the municipal infant departments, which made out that congenitally syphilitic infants were more liable to attacks of intercurrent disease. He thought these figures fallacies as they were not backed by pathological findings.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, London.

The opening meeting of this Section was held on the 14th of October, the President, Dr. James Taylor, occupying the chair.

Models Illustrating the Development of the Human Eye.

Miss Ida C. Mann showed a series of well-executed models to illustrate the development of the eye. For teaching purposes she regards them as superior to ordinary book illustrations.

Case of Probable Implantation Cyst.

Mr. L. Fleming exhibited a girl who, 18 months ago, received an injury to the eye. When she was seen six months after the receipt of the injury there was a perforation at the limbus, the iris was adherent, and there was active iritis present. Six months later a small nodule appeared at the nine o'clock position, but since that date there had been no appreciable increase in size.

Mr. Treacher Collins did not feel certain as to its nature, but suggested that the diagnosis might be helped by employing contact illumination.

Gray Mass in Vitreous.

Mr. Bookless showed a child with a gray mass in the vitreous with arborization of vessels visible at the back of the lens. A week after being seen, a small nodule appeared on the back of the iris. This had progressively increased, and vision was

reduced from $\frac{6}{36}$ to perception of fingers at a distance of a few inches. The diagnosis seemed to rest between a congenital abnormality and malignant disease.

SIR WILLIAM LISTER considered that it was a cyst of the iris, with a membrane which had formed after the occurrence of hemorrhage in the vitreous. He did not regard the condition as malignant.

MR. M. S. MAYOU referred to a case he showed at a previous meeting, in which there was a similar appearance, but without a membrane. He agreed that the present case was one of cyst of the iris.

MR. TREACHER COLLINS considered that the primary factor was the cyclitis, which had produced a cyclitic membrane. This membrane probably caused an arrest of lymph circulation, which had resulted in the separation of the two layers of pigment at the back of the iris, a cyst having been caused by that. He advised puncture of the body, which, he thought, would probably bring about its collapse.

Case of Benedict's Syndrome.

DR. WYLIE SEND and MR. LESLIE PATON demonstrated a case of Benedict's syndrome. The lesion was supposed to be in the red nucleus, catching the fibers of the third nerve.

The Fourth Cranial Nerve.

MR. J. HERBERT PARSONS, F.R.S., gave a contribution on what he termed the riddle of the fourth nerve, the only nerve which had, in a complete sense, a dorsal decussation. It was probable, he said, that there were no decussating fibers within the central nervous system other than those passing out in the trunk of the nerve. A peculiarity of the fourth nerve was, that it was purely somatic in mammals; it supplied purely somatic muscles, and had no visceral fibers. There was an absence of experimental lesions in this neighborhood sufficiently exactly localized to produce definite results. Explanation, therefore, must be sought in comparative anatomy and embryology. The 4th nerve existed all along down to the lowest vertebrates, as shown in a slide it was found even in the lamprey, in which animal the eyes were very degenerate

organs. The 4th decussated dorsally, going through the anterior medullary velum in that animal, exactly as in the higher vertebrates. He exhibited slides illustrating the work of Davidson Black, showing the position of the nuclei of the cranial nerves and their points of exit from the central nervous system. The same kind of thing was seen in various specimens of amphibiæ. Cappi believed that migration of motor nuclei was especially associated with chemio-taxis, due to the attraction to foci of incoming afferent impulses; and the last edition of Sir Arthur Keith's "Embryology" explained the 4th nerve as due to neuro-biotaxis, but as to this view Mr. Parsons expressed his scepticism. Still, there was no doubt of the fact that in the evolutionary process the afferent side became evolved very much in advance of the motor response. Mr. Parsons pointed out the near association of the fibers of the 4th with those of the 5th nerve at a very early stage of their development, both as to the relation of their branches and in regard to the ciliary ganglion. Investigation of the chief ganglion of the 4th nerve showed that it did not migrate from the motor part, but developed from the cells which were on the neural crest. There could be no doubt that this ganglion on the 4th was a posterior root ganglion, and that, certainly at this stage, the 4th nerve had motor somatic fibers in addition to sensory somatic fibers. He showed that complex synergic movements existed, brought about by nerve nuclei, with fibers which, presumably, decussated, and which were correlated with each other in a remarkable way in the absence of cerebral hemispheres. Therefore it must be concluded that even at a low stage there was an arrangement for coördinating the synergic movements of the eye muscles. Coördination was usually regarded as entirely cortical, and sufficient stress had not been laid on lower coördination centers. This idea did not detract from Hughlings Jackson's view; it merely divided Jackson's "top story" into a series of flats.

Dr. Gordon Holmes discussed the contribution.

Milestones in Refraction Work.

Mr. Ernest Clarke read a paper on this subject, based upon forty years of ophthalmic work. He said that at the

date he commenced to practise, it was rare to correct any astigmatism under .50 D., or $\frac{1}{80}$th of an inch. He passed his first milestone when, in his first year, he attended Donders' clinic at Utrecht, where more attention was being paid to refraction. In the Netherlands the diopter was thoroughly installed, whereas in London oculists were still prescribing in inches. An enormous debt was due to Donders for clearing up the subject of refraction and raising that department to a scientific level. His work, published in 1864, is still a classic; and though some of the statements had since been amplified, none had been negatived. At that date, too, retinoscopy or skiascopy had not become universal. The realization of the all-embracing and deleterious effects of eye-strain had taken many years; it was now known that there was scarcely any nerve trouble which might not be due, in whole or in part, to eye-strain. In this matter it was the small errors which counted. Still, symptoms commonly attributable to eye-strain might owe their origin to nasal or dental trouble. The skilled ophthalmologist would look for extra-ocular as well as ocular causes. If a young person had an error of refraction, the correcting glasses should be worn always in the house, though not necessarily at games out of doors. If this were done, the tendency was for small errors to disappear. Admittedly the wearing of glasses by the public school boy was a great disability.

Donders proved that presbyopia was not the opposite of myopia. Mr. Clarke had collected the records of 750 cases of myopia observed by him in the last 14 years. No case of high myopia with fundus changes was included, and all the cases given were treated by full correction, only allowing weaker glasses for near work in patients who were approaching the presbyopic period. The results were as follows: 101 showed a decrease in the myopia with the advance of age, and of these, 83 were over 30 years of age; 379 remained stationary, and of those, 306 were over 20 years of age. In 141 there was an increase in the myopia up to, but not exceeding, .50 D.; 129 increased in myopia .75 or more, and of these, 78 were under 15 years of age. Only 16 of the 750 increased over 2 D., and the maximum of 4 D. was reached by 5 patients. The common-sense treatment was to try to make the patient

normal by giving full correction of the myopia, and insisting that the glasses shall be worn for every purpose within doors; in this way the ciliary muscle was trained to do its proper work without undue convergence. Donders's best work was, probably, in association with presbyopia, yet it took years for his teaching to bear fruit. Every presbyope must be carefully examined, his static refraction ascertained, also his accommodation power, and with that knowledge one could safely give him an addition for near work. The correct treatment of presbyopia was one of the most important duties of the oculist, because these patients had arrived at a critical period of life, when they had many worries, and often were subjects of intestinal toxæmia, making it necessary to stop every channel of nervous waste. If it were found, by static refraction, that eye-strain was present, distance and near glasses should be prescribed.

Mr. Clarke had seen a great change in the attitude towards cycloplegics. In early days atropine was the drug used, and at that date it was used excessively, but only for the young. To arrive at the truth it was necessary to test with and without a cycloplegic. He had done that in reference to a large number of patients: *i.e.*, he put the patient through a complete objective and subjective examination and selected the glasses; then he had put him under atropine, or homatropine, and put him again through examination. In some of the cases the cyloplegia revealed nothing new, though in a large number it showed an important difference, a difference which would decide between success and failure in treatment. The oculist's note-book should record patients' static refraction, and in the majority of cases that could only be got, in a patient under 40 years of age, by using a cycloplegic. Once he had record of a patient's static refraction, he did not again put that patient under atropine. In the whole 40 years he had never had a case of glaucoma produced by a cycloplegic.

With regard to heterophoria, he spoke highly of Maddox's useful glass-rod test. He agreed with Maddox's opinion that small heterophorias tend to disappear when the error of refraction is properly corrected and the glasses worn. He referred also to the great improvement in the treatment of squint in recent years. He had praise for Meyrowitz's latest model of

ophthalmometer; it was, he said, a very accurate instrument, and a time-economizer. He touched also on the types of trial frames, and concluded with a comment on the three cardinal maxims which were given him by his old master Luther Holden: (1) Think of your patient first; (2) think of your profession second; (3) think of yourself last.

Dr. McCrea, speaking as a physician, emphasised Mr. Clarke's remarks as to the need for correcting slight errors of refraction; he had found them a prolific cause of the commonest symptom encountered by physicians, headache. With regard to cycloplegics, he, the speaker, did not care to read a report on a patient under 45 on whom a cycloplegic had not been used. He thought physicians should get more frequently into touch with such specialists as ophthalmologists.

Mr. Harrison Butler said he now seldom used mydriatics, and he believed he was getting considerably better results; his change of view he owed to his lamented friend Devereux Marshall. He suggested that some of the younger men might investigate how far the statement that the eyes were always changing with advancing years was true. He had discovered that certain patients got an alteration of the angle of astigmatism from time to time. With a certain type of cornea slight alterations might occur which varied the intraocular tension.

Mr. Ernest Clarke, in his reply, said he was certain the refraction was constantly altering.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

By Dr. CONRAD BERENS, Jr., Secretary

MEETING OF OCTOBER 17, 1921. DR. L. W. CRIGLER, CHAIRMAN

Professor Ernst Fuchs of Vienna read a paper on **Presbyopia** which appears in this issue of the Archives.

DISCUSSION

Dr. Alexander Duane: The subject of presbyopia covers so many matters deserving consideration, that one cannot touch on them all. I shall consider only a few that have special reference to Dr. Fuchs's interesting paper.

1. Not only the experiments of Hess but also those of Gullstrand on intra-capsular accommodation, demonstrate the truth of Helmholtz's explanation of accommodation as consisting of a passive relaxation of the lens rather than a forced dilatation of it, as described by Tscherning.

2. That the accommodation in presbyopes is actually of the amount indicated in the tables, *i.e.*, 1 or 2 D. or sometimes over, has been disputed, it being argued that the older patients see distinctly without using accommodation, because they contract their pupils to a stenopæic aperture. But this is certainly not so. I have made many measurements in such presbyopes, in whom the pupils were 3*mm* or so, and in whom there could be no question but that the accommodation was a genuine one.

3. Hess's conception of the difference between manifest accommodation, and what Dr. Fuchs happily terms physiological accommodation—*i.e.*, between the manifest increase of

refractive power produced by distension of the lens and the contraction of the ciliary muscle that causes that increase—seems almost unavoidable if we accept the Helmholtz theory. And yet, as I have repeatedly pointed out, there is a stumbling block in the way of its acceptance. Thus suppose we have three subjects, aged respectively 10, 30, and 41, having, all three, an amount of ciliary muscle energy (physiological accommodation) equal to 17 D. Owing now to the differing state of their lenses, the first has an accommodation (manifest or physical accommodation) of 14 D., the second one of 9 D., and the third one of 5 D., so that the amount of latent or unused ciliary energy in each is respectively 3 D., 8 D., and 12 D. Suppose further that we paralyze the ciliary muscle in all three with a gradually acting drug like homatropine. Obviously the latter will have to abolish all the latent ciliary energy before it produces any effect on the accommodation, that we can appreciate. It should therefore have a very different effect on the three persons. As the diagram, taken from an average case representing the action of homatropine in a young subject, shows, it should produce an appreciable effect in the boy of 10 in between 6 and 12 minutes, but in the man of 30 not till between 22 and 25 minutes, and in the man of 41 not till 35 minutes or later. Now repeated experiments that I have made show that the paralysis of accommodation produced by homatropine will begin to be apparent at about the same time in all three, namely in about 10—at any rate before 15 minutes. This would seem to indicate that the amount of latent accommodation in cases 2 and 3 is not as great as the Helmholtz theory as interpreted by Hess would indicate.

4. As Dr. Fuchs says the amount of physical accommodation put forth by a presbyope is known, since we can measure it, but the actual fraction of physiological accommodation exerted in performing an act of convergence is not known. I should certainly agree with Dr. Fuchs in thinking, in opposition to Donders, that the physiological accommodation exerted corresponds to the convergence, *i.e.*, that a man of 55 who with the aid of glasses is able to converge to a point 33*cm* from the eyes is using 3 D. of physiological accommodation (contraction of the ciliary muscle) even if only 1 D. of this can be utilized for the expansion of his lens. A proof of this reciprocal

relation between the convergence and the physiological accommodation in presbyopes, indicated by Dr. Fuchs, is found I think, in the fact that regularly the binocular accommodation in presbyopes in which convergence is necessarily employed is greater than the monocular in which there is little or no convergence. I think also, however, that at the beginning of presbyopia the following happens. The patient having, say 2 D. of physical accommodation, has received a 1.25 D. glass and is thus able to see an object at about 30*cm.* In so doing he probably uses, as Dr. Fuchs says, 3.25 D. of his physiological accommodation, corresponding to a convergence of this amount. That is, he contracts his ciliary muscle to an amount which if the lens were perfectly fluid would increase its refractivity by 3.25 D. But if he lets up a little on this contraction he finds that he can still see distinctly, because with the help of the glass he actually needs only 2 D. of ciliary contraction to accomplish his purpose. This discovery tends to make him relax the contraction more or less continuously when reading. But in so relaxing he also tends to relax his convergence, *i.e.*, develop an exophoria for near. That this sort of relaxation both of the accommodative and convergence effort actually takes place seems evident from the fact that putting on reading glasses for the first time does seem to develop an increase of exophoria for near points and to such a degree sometimes as to occasion trouble. In fact, it is not unlikely that in these patients there is a sort of see-saw between a condition of relaxed accommodation with exophoria or actual crossed diplopia and a condition of sharper accommodation convergence with single vision. This alternation would be quite sure to produce some confusion and asthenopia.

Naturally the amount of trouble due to this sort of exophoria increases with the convergence of the eyes, and this increases with the strength of the convex glass added for near. Hence the fact which we soon learn by clinical experience, namely that we must be careful not to make our convex additions too strong. A little difference in this regard makes a great difference in the patient's comfort. It is often better to sacrifice sharp definition for comfort, giving, for example, a +1.25 addition with which a patient reads a little less clearly than a

+1.50 with which he soon gets a disagreeable sense of strain and pull about the eyes.

5. The actual determination of the best reading glass in presbyopia is greatly facilitated by testing the uniocular and binocular accommodation with the trial glasses on. As a rule, in presbyopes under 48 a glass which brings the uniocular near point closer than 25*cm* (4 D.) and after 48 one which brings it closer than 28*cm*. (3.5 D.) is not well borne. The binocular accommodation may be a little greater. Generally, too, it is worth while, in case the uniocular accommodation is different in the two eyes to see if any unequal addition for reading does not give a more comfortable glass.

6. That presbyopes especially at the outset suffer quite often from asthenopia and sometimes also from other troubles of which Dr. Fuchs speaks (micropsia, delayed adjustment for distance due to actual transient spasm of accommodation) is a matter very little considered in textbooks and one to which I am very glad he had called attention.

With respect to asthenopia in presbyopes, I believe this is a complex matter, in which probably several factors act. Very often, at any rate, I believe it is developed in the way already mentioned by the exophoria that is produced or exaggerated by putting on reading glasses for the first time.

Dr. Fuchs's explanation of the micropsia occurring sometimes in presbyopia and of the transient spasm of accommodation for distance seems absolutely in accord with clinical and physiological facts. The second of these two symptoms, I believe, is fairly common. If continuously troublesome it might possibly be relieved by diverging exercises with prisms with the test object at a near point.

Dr. Colman W. Cutler expressed the deep appreciation that all those present felt in listening to the clear presentation of a subject which is not without difficulty, although in the hands of Prof. Fuchs it seemed simple enough. Dr. Duane had shown that the accepted theory of accommodation was not quite adequate and it may be that the theory of Tscherning or some analogous explanation will have to be considered as an alternative to the theory of Helmholtz. After such an address and the very able discussion by Dr. Duane, there seemed little to say on the subject of presbyopia.

The presence of Prof. Fuchs recalled very vividly the great kindness of the Master and the many opportunities that he offered so freely to the beginner in ophthalmology in Vienna. Among the teachers of refraction, was recalled Dr. George Bull, of Paris, who strove to help the individual, realizing that refraction was a scientific art and not a mere routine. His patience and persistence in analyzing the needs of the patient had been a precious lesson. Prof. Tscherning, then at the Sorbonne with Javal, had made physiological optics clear, with a scientific imagination that was inspiring. Among our own teachers of the Scientific Art, the speaker desired to recall Dr. W. S. Dennett, whose humor and shrewd common sense, as well as his science, make him an outstanding figure, cherished in the memory of his friends. This digression may be pardoned, as it is well to recall the names, too easily forgotten, of those who have helped to make Ophthalmology what it is.

Doctor Charles H. May cautioned against the common mistake of prescribing glasses for presbyopia according to age and in disregard of the fact that, within certain limits, age must be considered as more or less relative. He thought that in general, there existed a tendency to prescribe stronger glasses for the presbyope than were needed or were comfortable. The presbyopic individual should be permitted some choice in the selection. Notwithstanding the fact that we are in the habit of assuming the non-existence of latent hyperopia after a certain age, such latent hyperopia does exist not infrequently and this has to be taken into account in the prescribing of glasses. Just as different individuals of the same advanced age show different degrees of general strength and robustness, so they differ as to the power of the convex lens which must be made use of for close work. Hence the presbyope should be allowed a certain amount of license in selection. It is often found that an increase of two inches in the reading distance commonly accepted as the standard results in less fatigue and greater comfort.

Doctor G. W. Vandegrift suggested that presbyopia is a biological disharmony, being due primarily, perhaps to a degeneration of the ciliary muscle through the ages. If this is so it explains, also, weakness of the ciliary muscle found in myopia.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. Alling, New Haven; M. J. Schoenberg, New York; T. H. Butler, London; P. G. Doyne, London; and K. Wessely (*Archiv für Augenheilkunde*), Würzburg.

Edited by Matthias Lanckton Foster, M.D., F.A.C.S., New Rochelle, N. Y.

(*Concluded from the November issue.*)

VII.—THE ORBITS AND ACCESSORY SINUSES.

48. Erggelet. **Pulsating exophthalmos.** *Deutsche med. Wochenschr.*, 1920, p. 447.

49. Hajek. **Rhinogenous origin of retrobulbar neuritis.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 559.

50. Van der Hoeve. **Mucocele of the sphenoidal sinus and posterior ethmoidal cells with atrophy of the optic nerve.** *Zeitschr. f. Augenheilk.*, liii., p. 223.

51. Ischreyt. **Visual disturbances in consequence of orbital inflammations.** *Ibid.*, liii., p. 432.

52. Lauber. **Bony tumors of the orbit.** *Ibid.*, iii., p. 216.

53. Meller. **Retrobulbar neuritis, etiologically and therapeutically.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 556.

54. Pollems. **Local tumorlike amyloidosis in the orbit.** *Archiv f. Ophthalmol.*, ci., p. 346.

55. Rumbau. **Lymphosarcoma of the orbit.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 795.

Erggelet (48, **Pulsating exophthalmos**) reports a case of pulsating exophthalmos which resulted from a wound made by shrapnel. The common carotid artery had been tied elsewhere. A year and three quarters later exophthalmos and an easily palpable pulsation still persisted. A striking condition was the almost total lack of retinal vessels, which was ascribed to thrombotic processes and the effects of cicatricial contraction in the orbit upon the central artery of the retina.

HAJEK (49, **Rhinogenous origin of retrobulbar neuritis**) shows that pathological processes in the optic nerve are often caused by inflammations connected with the nose. The influence of dilatations of the ethmoidal labyrinth and of the sphenoidal sinus upon diseases of the contents of the orbit is not so certain. Anatomical preconditions to such diseases are present, for the ethmoidal cells often protrude so far that an inflammation there might be able to exert the same influence upon the optic nerve as an inflammation in the sphenoidal sinus. The true seat of disease is difficult to establish clinically, and pathological investigations are almost wholly wanting, yet one must be careful in making the diagnosis, as is shown by the case of Polyak in 1904, in which the condition was not one of empyema of the accessory sinuses, but one of myosarcoma, which started in the nose and injured the optic nerve through proliferation through the sphenoid. Inflammatory exudates or polypi of the accessory sinuses can exert pressure on the optic nerve. The writer refers to a case of his own of mucocele of the sphenoid, in which the optic nerve rapidly recovered after the mucocele had been emptied. He is of the opinion that it is not correct to assume a rhinogenous origin of an inflammation of the optic nerve when the changes in the accessory sinuses are slight, even when improvement follows a nasal operation. Several clinical histories are cited to prove that improvements and fluctuations of the vision occur when no nasal treatment has been undertaken.

VAN DER HOEVE (50, **Mucocele of the sphenoidal sinus and posterior ethmoidal cells with atrophy of the optic nerve**) reports a case of this nature. At the operation it was found that a tumor was present on the medial wall of the orbit, that the roof of the sphenoidal sinus had been destroyed, and that a probe could be passed to the dura. The latter fact precluded a more extensive operation. It could not be determined by the X-ray whether accessory sinuses on the other side were free or not. The varying symptoms in the visual field, the vision, and the muscles of both eyes, were referred to the fluctuations in tension and size of the mucocele. To all appearance the sphenoidal sinus was the first to become diseased. The ætiology was uncertain. The writer maintains that in cases of exophthalmos and disease of the optic nerve of doubtful

ætiology the accessory sinuses should be opened, whereby the diagnosis may often be cleared up and a proper treatment instituted.

Two of the cases reported by ISCHREYT (51, **Visual disturbances in consequence of orbital inflammations**) were of erysipelatous origin. The first case, that of a young woman 21 years old, was one of typical erysipelas. The right eyeball was protuberant, the vision badly impaired. The protrusion increased as the general condition became worse, and the cornea became cloudy because of the faulty closure of the lids. Little could be seen ophthalmoscopically, but the retinal vessels showed no special fullness. An opening above the eye into the orbital tissues failed to arrest the disease and the patient died with symptoms of meningitis. The second patient had had erysipelas eighteen months before. Since that time the vision of the left eye had been bad, and the pupil reacted only to accommodation. Both visual fields showed a large defect in the lower inner portion with no central scotoma. The ophthalmoscope revealed that both papillæ were pale, the left more so than the right. The veins were dilated and the right inferior nasal vein was thrombosed. The starting point of the orbital infection was in the lacrimal sac in the first case, not determined in the second. The injury to the optic nerves was probably due to toxines. In a third case the cause was inflammation of the antrum following extraction of a tooth. A subperiosteal abscess formed which broke externally. The antrum appeared to be free by the X-rays and by transillumination. An intermittent exophthalmos was caused when from time to time the abscess fistula became closed. The eye was blinded by optic atrophy, ascribed to the effect of toxines.

LAUBER (52, **Bony tumors of the orbit**) reports two cases of osteoma of the orbit. The first case was that of a man 37 years old, who for several months had suffered at times from very severe headache, exophthalmos, and loss of vision. Nose badly occluded. Examination showed exophthalmos of left eye, limited movements of the eye, tenderness of the left brow and temple. Ophthalmoscopically, left papilla much swollen, margins indistinct, arteries narrow, veins engorged. Vision, fingers at one meter. Visual field much contracted, especially

below and to the nasal side. The right eye had good vision, but the papilla was swollen, with indistinct margins, and the field was concentrically contracted. The X-rays showed an osteoma starting from the left ethmoid and extending into the left fossa of the skull, both nasal cavities and the left antrum. Removal of the tumor was followed by a normal healing. The position and movements of the eyes after operation were good. The right eye was normal, the left blind, a gray papilla with connective tissue changes and narrow vessels. The second case was that of a man 34 years old whose right was protuberant and displaced slightly downward, with slight limitation of mobility and occasional pain. A hard tumor could be felt between the eyeball and the nasal wall of the orbit. Vision, field, and fundus were normal. The X-rays showed a tumor as large as a nut in the orbit reaching to its roof. Operation was successful. The tumor originated from the ethmoid.

MELLER (53, **Retrobulbar neuritis**) discusses mainly the cases of retrobulbar neuritis in which a central scotoma is the only sign of the disease. The clinical pictures vary. Some begin acutely, some do not. Sometimes there is a history of coryza, headache, or sensitiveness to pressure on a nerve. If treatment of a disease of the accessory sinuses brings about a cure, the rhinogenous origin of the trouble is certain. The eye is often affected in non-purulent nasal troubles in which the rhinologist cannot positively exclude disease of the accessory sinuses. Even the thickening of the mucous membrane may cause trouble, so the ophthalmologist often desires nasal intervention. The nasal affection may pass away leaving the optic nerve trouble still existing; rhinogenous treatment is contraindicated in such cases. True recurrences of optic nerve disease are observed only in multiple sclerosis. There are many obscure cases which need to be cleared up through the coöperation of the ophthalmologist and neurologist.

POLLEMS' (54, **Tumorlike amyloidosis in the orbit**) patient was a woman 42 years old, who had had a swelling of the right upper lid for two years. Operation revealed a deposit of hyaline and amyloid in the connective tissue, and a hard, lobulated tumor three times as large as a bean between the roof of the orbit and the globe. The upper lid was swollen and slightly displaced outward and forward. In the inner

upper part of the left orbit could be felt a tumor as large as a bean. Microscopic examination proved the tumor to be composed of amyloid. The deposits of amyloid masses were enormous. The starting point could not be determined. The ætiology is obscure.

RUMBAU (55, **Lymphosarcoma of the orbit**) reports the case of a man 40 years old whose left eye became inflamed near the end of December, 1918. About three weeks later there was a distinct exophthalmos. The upper and outer margin of the orbit felt thickened. The diagnosis was made of empyema of the frontal sinus, the nose and other accessory sinuses being normal. At the second operation a tumor was found extending deeply into the orbit and adherent to the surrounding soft parts. It was removed in pieces, with a transient improvement of the exophthalmos. Although the general condition was found to be normal, mercury and seven injections of salvarsan were administered. The microscopic examination showed a diffuse round cell infiltration, gathered together in places in little masses, but no true tumor. Matters grew worse until the orbit was exenterated, leaving only a dense tumor layer in the lower part of the orbit. Radiation of this layer made it become smaller. There were no signs of leucæmia. Microscopic examination of the contents of the orbit showed that the tumor masses were particularly present about the optic nerve, gathered together in little heaps resembling lymph follicles. The musculature was permeated. The tumor tissue was very poor in vessels, the vessels unchanged. The pathologist pronounced the lesion to be a lymphosarcoma. The condition had to be differentiated from lymphoma, but exhibited certain clinical and microscopical changes which are to be met with only in true neoplasms. The starting point was uncertain; perhaps it sprang from an embryonal germ.

VIII.—THE CONJUNCTIVA

56. ALBERS-SCHÖNBERG. **Melanosarcoma of the corneal margin cured by X-rays.** *Deutsche Röntgengesellschaft*, Berlin, April, 1920.

57. BACHSTEZ. **A peculiar form of conjunctival ulcer.** *Ophthalm. Gesellschaft in Vienna*, March 15, 1920.

58. FRANKE. **Melanosarcoma of the limbus treated exclusively by the X-rays.** *Aerztl. Verein. in Hamburg*, May 4, 1920.

59. HIWATARI, K. **The diagnosis of trachoma granules upon the limbus conjunctivæ.** *American Journal of Ophthalmology*, March, 1921.
60. KRÜCKMANN. **Cause of trachomatous ptosis.** *Zeitschr. f. Augenheilk.*, lxiii., p. 305.
61. SANDER. **Treatment of hay fever.** *Aerzteverein in Stuttgart.*
62. TEICHNER. **A case of ulcer of the conjunctiva involving the sclera.** *Ophthalm. Gesellschaft in Vienna*, March 15, 1920.
63. UHTHOFF. **Conjunctiva tarsi in vernal catarrh.** *Ophthalm. Gesellsch. in Heidelberg*, August 5–7, 1920.

According to SANDER (61, **Treatment of hay fever**) any treatment aside from symptomatic is harmful during the attack. Personal prophylaxis is important. Treatment with lime, aimed to produce a thickening of the mucous membranes, tends to prevent the absorption of the harmful pollen. Pollen vaccine has been used with good results in several cases. If intended as a prophylaxis, the treatment should be begun in the fall, or at latest in the spring, with slowly increasing doses. When the disease has already broken out, one may try to arrest it by large doses. The size of the initial dose and the measure of increase is determined through the intracutaneous reaction, which also serves for the rarely needed differential diagnosis from vasomotor coryza. The hypersensibility can often be reduced to 1/100 of that at the beginning.

UHTHOFF (63, **Conjunctiva tarsi in vernal catarrh**) exhibited preparations of the tarsal conjunctiva taken from a patient who had suffered from vernal catarrh for 35 years. The conjunctiva was much thickened and showed a layer of epithelial cells proliferated in the form of a network into the subconjunctival tissue. In the meshes of this was to be found newly formed connective tissue, vascular in places, and an extensive deposit of lime. Macroscopically the thickened conjunctiva presented a pale brownish appearance with flat, papillary unevennesses, permeated throughout with concrements of lime.

KRÜCKMANN (60, **Cause of trachomatous ptosis**) thinks the true explanation is the difficulty of moving the lids because of the swelling. In chronic cases the uncompensatable loss of elasticity, due to the changes in the deep tissues, furnishes a sufficient explanation.

In BACHSTEZ'S (57, **A peculiar form of conjunctival ulcer**) cases ulcers developed from gray or grayish yellow pustules on

the conjunctiva during an acute conjunctivitis with severe symptoms of irritation. These ulcers, which were very often situated at the margin of the lid, were always superficial and never involved the sclera. Sometimes they were isolated, accompanied only by an acute conjunctivitis, sometimes they were associated with what looked like phlyctenules.

TEICHNER'S (62, **Ulcer of the conjunctiva involving the sclera**) case was that of a woman 52 years old who had a conjunctivitis marked by florid pointed elevations. A diagnostic injection of old tuberculin caused a severe general reaction and a local reaction in the lungs. In the conjunctiva, not far from the limbus, were eight small ulcers varying in size and depth. After these had healed traces of only the largest were visible, and one of these had involved the sclera deeply, leaving a sharply defined, punched out place about 1.5 *mm* in diameter. The Wassermann and bacteriological findings were negative.

HIWATARI (59, **Diagnosis of trachoma granules upon the limbus**) thinks that some of those who report trachoma granules at the limbus may have overlooked the fact that the cicatricial contraction of the conjunctiva sometimes brings the granulations near the cornea when they are primarily developed in the fornix. Also it is quite possible for a secondary infection to produce granulations resembling trachoma. In true trachoma the marginal portions of the granules, usually a narrow zone, consist of small lymphocytes while the wide interior parts, the germ center consist of large lymphoid cells. ALLING.

The patients of both ALBERS-SCHÖNBERG AND FRANKE (56, 58, **Melanosarcoma of the corneal margin cured by X-rays**) were treated exclusively with the X-rays with good results, and no recurrence had appeared in either at the end of two years.

IX.—THE CORNEA AND SCLERA.

64. AXENFELD. **Embryotoxon coreæ posterius.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

65. BOTTERI. **Contribution to the pathology of scleritis.** *Klinische Monatsbl. f. Augenheilkunde*, lxiv., p. 666.

66. CALHOUN, P. F. **Primary epibulbar carcinoma.** *American Journal of Ophthalmology*, February, 1921.

67. GRÜTER. **Optochin, with special reference to ulcus serpens** *Zentralbl. f. d. ges. Ophthalm.u.ihre Grenzgebiete*, iii., 3, p. 81.

68. GRÜTER. **Experimental and clinical studies of herpes corneæ.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

69. JABLONSKI. **Congenital melanosis of the sclera.** *Berl. Ophthalm. Ges.*, April 22, 1920.

70. JUNIUS. **Observations and thoughts concerning rodent ulcer of the cornea.** *Zeitschr. f. Augenheilk.*, xliii., p. 480.

71. KOEGEL. **A rare syphilitic disease of the eye.** *Med. Ges. in Jena*, January, 1920.

72. LÖWENSTEIN. **Recent findings in the study of herpes.** *Ophthalm. Ges. Heidelberg*, August 5–7, 1920.

73. POLLACK. **Amyloid (hyaline) of the conjunctiva and cornea.** *Berl. Ophthalm. Ges.*, April 22, 1920.

74. RUMBAUR. **Large dermoid of the cornea and sclera.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 790.

75. STEIGER. **Variability of the corneal astigmatism.** *Zeitschrift f. Augenheilkunde*, xliii., p. 144.

76. UHTHOFF. **Dystrophia corneæ epithelialis.** *Ophthalm. Ges. Heidelberg*, August 5–7, 1920.

After investigation of a large amount of material STEIGER (75, **Variability of the corneal astigmatism**) considers it certain that the astigmatism of the human cornea undergoes greater or less change in half the eyes between the sixth and the twelfth year, and that this change is of practical importance in a large number of the cases. Increase of astigmatism during the time of observation was much less common than decrease. Originally unlike eyes develop independently. Only 1.5% of 397 eyes had full vision or better when first examined, but in five years and a half this had increased to somewhat over 50%.

The disease had lasted over ten years in UHTHOFF'S (76, **Dystrophia corneæ epithelialis**) patient, affecting first the right eye and later the left, and presenting the clinical picture accurately described by Fuchs in 1910. In the right eye the disease finally resulted in an intense grayish white opacity of the entire cornea, with the exception of a narrow strip at the margin, with some vascularization. The surface was smooth, but the diseased area was slightly swollen. The superficial layers of a portion of the diseased area of the cornea were removed for examination. The epithelial layer was thickened, the superficial portion swollen in places. The upper epithelial cells were in places drawn out longitudinally, so that occasion-

ally they seemed to be parallel fibers. The lowest layer of the basal cells alone could be called practically normal, but even here some of the cells showed pathological changes. Bowman's membrane was entirely absent. The superficial layers of the corneal tissue were in places completely degenerated and transformed into a matted tissue of fine fibers with a sparse amount of degenerated cornea. In other places the corneal tissue was broken down into broad, wavy lines, and œdematous. The changes affected the superficial layers of the cornea particularly, while the deeper ones seemed to be still transparent.

AXENFELD (64, **Embryotoxon corneæ posterius**) pictures the case of an otherwise normal young man in both of whose eyes there was a whitish ring about *1mm* from the margin of the cornea at the level of Descemet's membrane, to which ran a number of minute fibers from the anterior surface of the iris through the anterior chamber. Between this ring and the periphery was a very delicate cloud at the same level. There was no minor circle of the iris, and there was a partial coloboma of the anterior surface in the left; otherwise the irides were normal. This was a case of imperfect differentiation between the iris and the cornea.

The investigations of LÖWENSTEIN (72, **Recent findings in the study of herpes**) seem to show that the virus of febrile herpes has no special affinity for the corneal nerves. He is of the opinion that many forms of iritis in which the ætiology is obscure are of herpetic origin, and that the iritis of certain infectious diseases, which are associated with herpetic blebs, should be ascribed to the herpes virus.

GRÜTER (68, **Studies of herpes corneæ**) believes that there is a specific virus which induces a necrosis that gradually passes from the epithelium into the adjoining layers of the parenchyma. This virus is very sensitive to temperature, and must be carried immediately from cornea to cornea in inoculation experiments.

GRÜTER (67, **Optochin**) claims that optochin is a specific bactericide for pneumococci. The streptococcus viridans also is affected by optochin, but is decidedly more resistant. Addition of serum induces a precipitation of albumin in test tube experiments, and a moderate inhibition of the bacteri-

cide power of optochin. Pneumococci taken immediately from ulcers or the conjunctiva are a hundred times more resistant to optochin than laboratory stocks, yet the bactericide effect is not demonstrably influenced by a high degree of virulence of the pneumococci. A fresh solution must always be used, for a solution will not keep longer than fourteen days. Solutions under 1% in strength are inefficient for the treatment of ulcus serpens and the sterilization of the conjunctiva. Optochin hydrochlorate must not be combined with atropine sulphate, because such a combination will result in the precipitation of the insoluble optochin sulphate. For ulcers with deep infiltration a daily application of 5% optochin for five minutes is recommended; stronger solutions cauterize the cornea and conjunctiva. He warns against injections into the cornea or anterior chamber. The conjunctival sac can be cleared of pneumococci by the instillation once or twice a day of a one or two per cent solution of optochin for at least two days. In diseases of the lacrimal sac optochin is of only transient benefit. In ulcus serpens the result depends on the site of the pneumococcal focus. In superficial ulcers the remedy does good service, but the effect becomes less as the infiltration becomes deeper and more extensive. Prolonged use of optochin induces irritation with iritis and danger of secondary glaucoma. Faulty regeneration of epithelium with the possibility of reinfection has been observed after repeated use of optochin. The duration of treatment is not materially shortened, and this method does not surpass others in the treatment of ulcers with deep infiltration.

According to JUNIUS (70, **Rodent ulcer of the cornea**) the rodent ulcer is a primary disease of the cornea, not connected ætiologically with episcleritis. Its typical seat is near the margin, where it starts as an infiltrate in the cornea; a central starting point has been observed thus far in only a single case. There are abortive forms which run a benign course. The following points are indicative of a neuropathic basis for the disease: The reduction of the sensibility of the cornea, which is not always demonstrable; the interference with the tension of the eye likewise not always demonstrable; the involvement of the ciliary nerves in the pathological process, and its relations

to other forms of corneal disease of neuropathic origin, particularly herpes corneæ. Of the symptoms which generally accompany peripheral nerve lesions, œdema, formation of blebs, and necrosis, necrosis at least is a constant accompanying symptom of the corneal affection, and, as in other neuropathic corneal diseases, the advance of the disease is in many cases the first to be discontinued. The cause of the disease is to be sought in some cases in the peripheral trigeminus, in others in the ganglia and the central part of the trigeminus. The fact that the trouble is bilateral in more than a third of the cases goes to show that a central site is not uncommon. Bacteria probably take part in the development of the ulcer, but clinical experience indicates that there is no specific agent. Every agent can be found, for the resistance of the cornea to each is neurotrophically weakened. The rare observations of dystrophia marginalis corneæ in childhood indicate a special sensibility of the marginal portions of the cornea to any injury. If Junius's ideas concerning the nature of this disease are correct, cauterization should be excluded from the methods of treatment as inefficient and probably harmful.

KOEGEL'S (71, **A rare syphilitic disease of the eye**) patient had a yellowish infiltration of the cornea and secondary glaucoma in one eye, which was enucleated. After a short time the same disease attacked the other eye, with violent symptoms of inflammation. Syphilis was determined to be the cause, and recovery was prompt after treatment with salvarsan.

POLLACK (73, **Amyloid (hyaline) of the conjunctiva and cornea**) says that, although the microscopic picture was that of amyloid, the various tests for amyloid reactions gave a negative result, whether tried with fresh or hardened material. The tumor should perhaps be spoken of as one of hyalin which did not differ from amyloid morphologically, but did differ in its microchemical reaction.

CALHOUN (66, **Primary epibulbar carcinoma**) removed a tumor about the size of a hazel-nut which was attached to the sclera. As it proved on examination to be a carcinoma he made three applications of radium. One year later the patient returned with a small recurrence and an enlarged preauricular gland. Both were excised and after six years no return of the

tumor has taken place. He advocates conservative surgery when the tumor is remote from the limbus, even though large, and thinks that radium should be used. Involvement of the preauricular gland is not necessarily serious according to his present experience. ALLING.

The tumor reported by RUMBAUR (74, **Large dermoid of the cornea and sclera**) was taken from the eye of a child 1 year old. It was congenital and had grown rapidly. It was 12*mm* high by 17*mm* broad at the base, projecting like a sac from the sclera and cornea. The peculiarity of the case was the excessive growth of the tumor, both intra- and extrauterine, and the size finally attained, which seems to the writer to have been unique. The development of the eyeball had not suffered from the growth of the tumor, so far as could be recognized from the few sections.

BOTTERI'S (65, **Scleritis**) case is remarkable on account of the severity and extent of the infiltration, which reached far back of the equator, on account of the rare appearance of a large scleritic nodule near the optic nerve, and on account of the simultaneous infiltration of the orbital fat, which is unusual in scleritis.

JABLONSKI (69, **Congenital melanosis of the sclera**) designates as symptoms of melanosis oculi a dark, spotted or diffuse, discoloration of the sclera, a heavily pigmented iris with a uniformly felted or papillary surface, and a dark tone of the fundus, usually of only one eye. The peculiarities of the two cases reported by him were that in both the condition was bilateral, the scleræ were abnormally thin, the function was affected and in one case the more melanotic eye was the more myopic, and the trouble seemed to be familial, as the patients were sisters and the parents showed signs of abnormally great pigmentation.

X.—THE PUPILS.

77. BEHR. **The reaction of the pupil to the closure of the lids.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

78. FRIEDENTHAL. **Monolateral perverse reaction to convergence.** *Berl. Ophthalm. Gesellschaft*, 1920.

79. GROENTHUYSEN. **The motor and optic sensitiveness to differences in diseases of the eye.** *Ophthalm. Gesellsch. Heidelberg*, Aug. 5–7, 1920.

80. OLOFF. **Hemianopic pupillary reaction.** *Ibid.*, August 5–7, 1920.

While the reaction of the pupil to closure of the lids is present in all normal persons, it is usually difficult to demonstrate. The cause of this difficulty is to be found, according to BEHR (77, **Reaction of the pupil to the closure of the lids**), in an inhibition through the sphincter tone dependent on the light reflex. It is much more distinct in amaurotic pupillary immobility, when it may approach very nearly a normal reaction to light or convergence. If the amaurotic immobility passes away, this reaction again becomes indistinct. As a rule it is very distinct in reflex immobility in consequence of the abolition of the inhibition through the light reflex. In absolute immobility it is absent in a third of the cases, is pathologically involved in a second third, and is prompt in the remaining third. In ophthalmoplegia interna it is absent in perhaps a fifth of the cases, imperfect in rather more than half, and normal in about a half. In central oculomotor paralysis it is lost together with the other pupillary reactions in the great majority of cases, but may be either impaired or normal even when the pupils are immobile to light and convergence. In peripheral oculomotor paralysis this reaction as a rule parallels the reaction to convergence; if one is lost so is the other, if one is preserved, the other exists to a like degree, although there are exceptional deviations from this rule. The preservation of the reaction to closure of the lids in central pupillary paralyses suggests the possibility that the lesion spares the nucleus of the sphincter and is localized in the region of the extra or supranuclear conducting tracts. This would explain how it is that the Edinger-Westphal nucleus is spared in the general nucleus degeneration of central oculomotor paralysis in spite of the clinically established immobility of the pupils.

FRIEDENTHAL'S (78, **Monolateral perverse reaction to convergence**) patient had bilateral immobility to light. The right pupil was the larger and contracted in convergence, while the left was smaller and dilated in convergence. The patellar reflexes were weakened, the Wassermann positive.

GROENTHUYSEN (79, **The motor and optic sensitiveness to differences**) gives the results obtained thus far in the study of the pupillary movements with the aid of Hess's pupilloscope. He first established the fact that in normal cases the most minute differences of light strength which can be recognized

as different by the examined eye suffice to induce a contraction of the pupil by the stronger. The optic sensibility to difference is therefore equal to the motor sensibility to difference. Differences of light strength in the ratio of 95:100 suffice to excite both. By means of this method disturbances in the play of the pupils can not only be recognized earlier than was hitherto possible, but the degree of disturbance can also be expressed in figures. The consensual motor sensibility to difference is the same as the direct. In diseases of the reflex arc not only are greater differences of light strength necessary, but the values of the individual sensibilities to difference frequently decline in so characteristic a manner as to furnish a valuable diagnostic help in the localization of the lesions. For example, in optic atrophy the motor and optic sensibilities always are reduced the same amount, while in a chronic retrobulbar neuritis the motor is usually reduced to a greater degree than the optic. In the so-called reflex sluggishness the motor is reduced to a degree corresponding to the trouble, while the optic always remains normal.

OLOFF (80, **Hemianopic pupillary reaction**) reports a case of shot-wound of the brain, which induced symptoms referable to the eye alone in the form of a left-sided homonymous hemianopsia with immobility to light when the right halves of the retinæ were irradiated. Irradiation of the left halves of the retinæ caused the pupils to react promptly. The probable diagnosis was that of a lesion in the right tract, and the rœntgenograph showed the presence of the projectile in the region of the right optic tract.

XI.—THE UVEAL TRACT AND SYMPATHETIC OPHTHALMIA.

81. AXENFELD. **Movable inflammatory pupillary membrane.** *Zeitschrift f. Augenheilkunde*, xliii., 1920.

82. CLAPP, C. A. **Significance of syphilis as an ætiological factor in acute iritis.** *American Journal of Ophthalmology*, March, 1921.

83. DANIS, M. **Proliferating choroiditis.** *Ibid.*, March, 1921.

84. HEITMANN. **A noteworthy tumor of the ciliary body.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., 1920.

85. HERRENSCHWAND. **Clinical contribution to the coincidence of a tuberculous and a syphilitic infection in the same eye.** *Ibid.*

86. JESS. **A case of sympathetic ophthalmia.** *Deutsche med. Wochenschr.*, 1920, p. 616.

87. KADLETZ. **Sarcoma of the choroid without detachment of the retina.** *Ophthalmic Society of Vienna*, March 15, 1920.

88. KADLETZ. **Deposit of lime in the ciliary processes.** *Ibid.*

89. VON SZILY, A. **Melanoma of the choroid.** *Ophthalm. Gesellsch. Heidelberg*, August 6–7, 1920.

90. WETZEL. **Sympathetic ophthalmia and disturbances of hearing.** *Monatschr. f. Unfallheilk u. Invalidwesen*, xxvii., No. 4.

AXENFELD'S (81, **Movable inflammatory pupillary membrane**) case, met with in an otherwise sound man 25 years old, was evidently not a membrana pupillaris perseverans, but rather was of inflammatory origin, though it probably started very early, perhaps during embryonal life. In the small pupil a folded, grayish white membrane, which impaired the vision considerably, was visible. When the pupil was dilated the membrane became smooth and transparent, so that the vision was improved, and the fundus became visible as through a thin veil. With the binocular loupe it could be seen that the membrane had nothing to do with the anterior layer of the iris, yet was connected with the posterior layer in several places by a sort of posterior synechiæ. A connection with the lens was not demonstrable, and therefore the membrane was movable. The writer thinks that adhesions to the lens had formerly existed, but had broken loose. He felt no doubt as to the inflammatory character of the condition.

CLAPP (82, **Significance of syphilis as an ætiological factor in acute iritis**) reports the results of his experience in reference to syphilis as the cause in one hundred cases of acute iritis and found 80% due to this disease. It is to be noted that 68 of the cases belonged to the colored race and also that the diagnosis in some cases was made from the fact that the case made a speedy recovery under antisyphilitic treatment. ALLING.

HERRENSCHWAND (85, **Tuberculous and syphilitic infection in the same eye**) reports a case in which an iritis in a woman 42 years old was positively diagnosed as tubercular, healed under specific treatment, recurred once, and finally got entirely well. Seven weeks later there appeared in the same place a typical syphilitic papule, which disappeared under specific treatment. A fresh syphilitic infection had been acquired. The interesting point in the observation is that the site of the formerly tuberculous place formed a locus minoris resistentiæ.

Tuberculosis and syphilis frequently occur simultaneously in the eye, but syphilis commonly precedes the tuberculosis.

HEITMANN (84, **Tumor of the ciliary body**) describes a case in which the eye of a girl 13 years old was enucleated on account of what had been diagnosed as a pigment sarcoma. The histological examination showed the tumor to be one difficult to classify in the known groups. Microscopically it resembled a gumma or a sarcoma. Tuberculosis was excluded. Although it was probably a melanosarcoma, and the enucleation was justified, the case suggests the advisability of a short course of treatment with iodides being tried before enucleation is resorted to.

KADLETZ (88, **Deposit of lime in the ciliary processes**) exhibited specimens of five eyes with deposits of lime in the ciliary processes. The causes of enucleation were panophthalmitis, atrophy after cataract extraction, necrotic sarcoma, sarcoma of the choroid without changes in the anterior portion of the eye, and an epibulbar sarcoma likewise without changes in the rest of the eye. The ciliary processes had undergone hyaline degeneration in places, and here the lime was found in larger masses, some sharply defined, others reaching over the entire breadth of the processes. As two of these eyes were without other changes here, it is probable that these changes were of age.

DANIS (83, **Proliferating choroiditis**) found a club-shaped gray white mass covering the optic nerve and protruding into the vitreous. The posterior pole of the eye was slightly excavated and there was a circle of peripapillary choroiditis with abundant pigmentation. The lesion was the result of a severe contusion. Lagrange has described proliferating choroiditis which differs from the simple proliferating retinitis in that it presents a more regular and localized mass instead of a weblike character. The mass is opaque and of even surface. The usual location is at the macular or the nerve. It is accompanied by pigmentation and does not produce retinal detachment. ALLING.

KADLETZ (87, **Sarcoma of the choroid without detachment of the retina**) reports a case in which the retina was split by the growth instead of being detached. The tumor was 8.9*mm* broad at its base, 4.31*mm* high. It was a leucosarcoma with-

out necrosis. The retina was split into two layers, so that only the cerebral layer covered the growth. The outer neuron and the optic nerve were slightly atrophic.

The case reported by VON SZILY (89, **Melanoma of the choroid**) is said to be the first to be studied both clinically and pathologically. The six cases already reported were found as such in pathological preparations. The clinical picture in the fundus differs from that of the beginning sarcoma and rather resembles the so-called grouped nævoid pigmentation. The histological picture is that of proliferation and enlargement of the chromatophores with marked accumulations of pigment, particularly in the outer and middle layers of the choroid, the choriocapillaris and pigment epithelium being spared. Melanoma of the choroid seems to be a benign proliferation of cells.

JESS (86, **A case of sympathetic ophthalmia**) reports the case of a battle wound which led to sympathetic ophthalmia. The patient refused to allow the wounded eye to be removed. At the end of four weeks sympathetic ophthalmia was present, starting with a neuroretinitis, and developing a severe plastic iridocyclitis which was under treatment for a year and a half. The traces left by the iridocyclitis can still be seen. The vitreous is clear, while the fundus shows small spots of choroiditis. Normal color sense is present in only a temporal crescent of the retina, elsewhere there is total blue-yellow blindness. There is also a high degree of disturbance of adaptation.

WETZEL'S (90, **Sympathetic ophthalmia and deafness**) case was one of penetrating wound of the eye which excited sympathetic ophthalmia in about five weeks. The wounded eye was removed, but not examined. From the time of his entrance into the hospital the man was deaf, and his deafness was believed to have been caused by the sympathetic ophthalmia. The explanation presented to account for the involvement of the labyrinth is that the pigment here acts as an antigen to induce an anaphylactic phenomenon just as it does in the unwounded eye in sympathetic ophthalmia.

XII.—THE LENS.

91. BECKER. **Bilateral total cataract and secondary glaucoma after a severe electric shock.** *Heidelberg Ophthalm. Gesellsch.*, August 5–7, 1920.

92. RUMBAUR. **Another remarkable case of copper cataract.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., 1920.

BECKER'S (91, **Bilateral cataract and secondary glaucoma after a severe electric shock**) patient came into contact with an electric current of 60,000 volts, received burns of the first, second, and third degrees on various parts of his body, and shortly afterward opacities were observed in both lenses. These developed within three and a half months into total cataract, with severe glaucomatous pain caused by the swelling of the lenses. An iridectomy was performed on each eye to relieve the pain, and later the cataracts were removed. Correcting glasses gave the patient perfect vision for distance and near.

RUMBAUR'S (92, **Another remarkable case of copper cataract**) patient had been wounded in the face and right eye five years before. The eye had suffered penetrating wounds, but no intraocular foreign body could be found at the time. The most marked symptom five years later was a central opacity of both the anterior and posterior capsule of the lens. Both were iridescent, the posterior the more so. By focal illumination with the corneal microscope and the Nernst slit lamp a relief-like shagreening became visible with deeply saturated metallic colors, red, blue-green, yellow, and transition colors. In transmitted light only fine, colorless shadows could be seen, coming from the posterior opacity. With the ophthalmoscope extensive contusion changes could be seen in the choroid and retina, pigment spots in the macula, and preretinal cords. The rœntgenograph revealed several minute foreign bodies in the orbit, of which only one could possibly be in the eyeball. The condition of the lens was considered characteristic of the specific chemical action of an intraocular foreign body composed of or containing copper, and this diagnosis was made although no foreign body was distinctly demonstrable.

XIII.—GLAUCOMA.

93. AXENFELD. **High myopia and glaucoma.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

94. BRANDT. **Experiences with Elliot's trephining.** *Ibid.*

95. CREMER. **Experiences with cyclodialysis.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 802.

96. HAMBURGER, C. **The mechanics of glaucoma and of its operations.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

97. HERTEL. **Studies of the blood and aqueous in glaucoma.** *Ibid.*

98. KÖLLNER. **Observation concerning the pressure reducing action of miotics in simple glaucoma.** *Zeitsch. f. Augenheilkunde*, xliii., p. 421.

99. KÖLLNER. **Demonstration of curves showing the influence of the size of the pupil upon the tension in simple glaucoma.** *Ophthalm. Gesellsch. Heidelberg*, August 5–7, 1920.

100. KOEPPE, L. **The stereomicroscopic picture of the living angle of the anterior chamber in glaucoma with Gullstrand's Nernst slit lamp.** *Ibid.*

101. SHAHAN, W. E., and POST, L. **Thermophore studies in glaucoma.** *American Journal of Ophthalmology*, February, 1921.

HAMBURGER (96, **Mechanics of glaucoma and of its operations**) points out that a local increase of pressure accompanies all inflammations in the body, with the single exception of the eye, in which the typical intraocular inflammation induces a softening instead of a hardening of the globe. This must be due to the presence of many outlets. Primary inflammatory glaucoma is based on quite different mechanics, for in this the eye is hard, just as in inflammation elsewhere in the body. The mechanical explanation of cures wrought by iridectomy and trephining is untenable, for cicatrices are not more, but less permeable than physiological tissue. Therefore it may be better to give up all claim to a mechanical explanation, just as general surgeons do in the curing of abdominal tuberculosis by incision. At best one may consider that in the operative treatment of glaucoma an influence is exerted upon the nerves in a way similar to that in which many angioneuroses are benefitted by nerve stretching. It is possible that this inflammation of the eye is of psychogenous origin, a neurosis.

According to AXENFELD (93, **High myopia and glaucoma**) the diagnosis of glaucoma is not made in many cases of high myopia for the following reasons: 1. The loss of vision may seem to be perfectly explainable, in a brief examination, by the well known myopic changes about the papilla and especially in the macula, unless the periphery of the visual field is studied and defects found here, which are not satisfactorily explained by the changes in the myopic fundus, an investigation not made by many in high myopia. The interpretation of peripheral contractions is also difficult, as high myopia can induce certain contractions by itself. But extensive defects, especi-

ally on the nasal side, arouse suspicion of glaucoma. Axenfeld believes that even in extreme myopia, when the optic nerve is not particularly involved, there are no great peripheral contractions and disturbances of orientation. 2. The ophthalmoscopic picture of the papilla in high myopia with glaucoma simplex need not present the typical picture of glaucomatous excavation. This is not distinctly formed in the majority of cases in which there are marked changes due to stretching. It may be very serious for the patient when one feels inclined to suspect glaucoma only in the presence of a marked excavation. Even in advanced cases the papilla may be only pale, yet it may be difficult or impossible to diagnosticate commencing atrophy, because the temporal side of the disk may be just as pale in high myopia. 3. The increase of tension of a simple glaucoma in a highly myopic eye is slight and may be within physiological limits. The writer has not seen much increase of tension in cases of this nature. For the diagnosis one must rely more than heretofore upon the margins of the peripheral visual fields, especially when the disturbances of vision are serious and increasing. Tonometry should be used more in high myopia, and when the condition of the visual field is suspicious the effect of miotics should be controlled by the tonometer. A marked lowering of the tension by pilocarpine will at least contribute toward the diagnosis, naturally taking into account the physiological fluctuations and the fact that miotics can lower the tension even in normal eyes. Particularly important are the natural differences of tension between the two eyes. With regard to operative measures, cyclodialysis is best suited to the very myopic eye, as it does not empty the anterior chamber and cause a sudden loss of tension.

KOEPPE (100, **The stereoscopic picture of the living angle of the anterior chamber in glaucoma**) describes the appearance of the surface of the ciliary body at the base of the angle, the course of the uveal framework of the ligamentum pectinatum, the ciliary margin of the iris, and the ciliary processes bridging over the angle, as seen by him with the aid of a special instrument which magnified the images forty times. The latter are pigmented in varying density, arise from the ciliary margin of the iris, and are inserted into the scleral framework of the inner surface of the root of the cornea. The entire net-

work covering the surface of the ciliary body shows lucunæ and resembles the surface of the iris, but it may also be very sparse. Retinal pigment occurs sporadically in the framework, or on the adjoining root of the iris, varying in size and distribution, and likewise on the inner surface of the root of the cornea. Occasionally Schlemm's canal could be made out as a dark zone. Isolated vascular twigs and loops were visible, together with a marked circular and meridional structure of the inner surface of the root of the cornea. In old age there appears a beginning atrophy of the uveal trabeculæ of the ligamentum pectinatum, as well as of the adjoining root of the iris and ciliary processes. Sometimes rather irregularly distributed dark pigment or dark lumps of pigment are to be seen, both referable to the wearing away and dispersion of the retinal pigment edge of the pupil toward the cornea and the angle of the anterior chamber. In persons predisposed to glaucoma, who have shown no clinical signs of this disease, there is a distinct displacement of pigment in the iris, and one may observe this, or other slight signs of age of the tissues, as well as a narrowing of the space of the angle by an approximation of the most peripheral zones of the iris to the inner surface of the root of the cornea so as to diminish the size of the visible portion of the surface of the ciliary body. In clinically manifest glaucoma these signs were especially marked, though the examination was rendered difficult or impossible in the inflammatory and secondary forms by the deposits of pigment and the cloudiness of the aqueous. One finds a more or less distinct stromal atrophy, and occasionally rather more strongly marked dark deposits of pigment in the framework of the surface of the ciliary body. Yet the chief factor in these cases was the covering of the surface of the ciliary body, or, in far advanced cases, of the corresponding portions of the inner surface of the root of the cornea by the most peripheral zone of the iris. In simple glaucoma Koeppe always found a smooth involution of the root of the iris to the cornea and no distinct signs of adhesion. The picture resembled that of the normal angle during mydriasis. He thinks that simple glaucoma is a symptom of a progressive encroachment of the root of the iris upon the corresponding part of the inner surface of the root of the cornea.

KÖLLNER (99, **Influence of the size of the pupil upon tension in simple glaucoma**) kept four patients with simple glaucoma alternately a day in a dark room and a day in the bright sun, but could detect no noticeable influence on the tension by the great changes in the size of the pupils. Artificial dilatation with homotropine, atropine, and scopolamine in eleven other cases caused no increase of tension, even though the mydriasis was continued for days. Only in one case, in which there was a particularly high degree of pigmentation of the iris and in the angle of the anterior chamber, there appeared in the course of five hours each time an increase of tension from 26 to 36. In pure glaucoma simplex, when the anterior chamber is not shallow, it would appear that a folding and unfolding of the iris is without noticeable influence on the tension in the majority of cases, or on the escape of fluid from the eye. If this is true, the action of miotics does not depend primarily on the unfolding of the iris.

KÖLLNER (98, **Pressure reducing action of miotics in simple glaucoma**) showed by curves that the contraction of the pupil may precede the fall of tension by as much as two hours. The time may be less, or even absent, in others. Otherwise the effect upon the pupil and the tension is uniform, and lasts one, two, or three days before it disappears completely. The effect of pilocarpine is of shorter duration than that of eserine. Both curves, those showing the contraction of the pupil and the tension show a sharp drop and a slow rise. Occasionally there are exceptions, in which the fall of tension may disappear first, or, rarely, last longer than the contraction of the pupil Sometimes it happens that the pupil contracts well, but there is no fall of tension. That the influence of miotics is essentially upon the internal muscles of the eye, rather than through a possible contraction of the blood vessels is shown by an experiment in which eserine was instilled into one eye, and adrenalin injected beneath the conjunctiva of the other in the same patient. The tension of the first eye fell sharply, that of the second fell, but not to the same degree. If homatropine followed by eserine is instilled, the effect of the latter is slighter than it should be, or is wholly prevented, another evidence that it is not the vessel contracting power of eserine which is the essential feature of its action, although it may be of assist-

ance. It is more likely that a better outflow is made possible by an unfolding of the iris, just as through the unfolding of the ligamentum pectinatum by the ciliary muscle.

BRANDT (94, **Trephining**) reports 643 operations for glaucoma, including 375 trephinings according to Elliot's method. In glaucoma simplex trephining is unquestionably superior to iridectomy. The glaucoma had been brought to a standstill in 78.8% of 66 trephined eyes which had been under observation at least a year, and an average of three years. In inflammatory glaucoma iridectomy is preferable, as it suffices in the majority of cases without the danger of late infection. In glaucomatous iritis and secondary glaucoma due to luxation or subluxation of the lens, trephining is the more promising, while in secondary glaucoma caused by exclusion of the pupil iridectomy alone should be considered. In the buphthalmos of children the superiority of trephining over multiple sclerotomies could not be established. Eight late infections occurred, resulting in five in blindness or loss of the eye. Other complications are of less importance.

CREMER (95, **Cyclodialysis**) has performed cyclodialysis on eleven eyes, on part of them over six years ago. The results were exceptionally good. In one case the operation had to be repeated at the end of two years. It should be performed as early as possible.

HERTEL (97, **Studies of the blood and aqueous**) has measured the osmotic concentration of the blood by the hæmolytic method in a large number of cases of glaucoma. The figures found were often so much lower than that of eyes which were normal or suffering from other disease as to seem to justify the assumption that the transport of salt and water is disturbed in glaucomatous eyes. He calls attention to the influence of the internal secretions, especially of the thyroid, upon these processes, on the basis of clinical observations. He found nothing to support the theory of disturbances through colloids caused by an abnormal formation of acid. In glaucoma, as compared with diseased eyes without increase of tension, there was neither a diminution of the carbonic acid tension in the blood, nor unequivocal differences in the hydrogen in concentration of the aqueous.

SHAHAN and POST (101, **Thermophore studies in glaucoma**)

have been experimenting with rabbits and proved that the intraocular tension may be reduced by application of the thermophore. They have also treated a number of cases of glaucoma. The cases which had a swollen lens and shallow anterior chamber were not benefited but the cases of simple glaucoma showed a falling of the tension within 48 hours and it remained low for a number of months. Then came a return of the tension which responded readily to the application of heat. Further experience is necessary to establish the value of the method. ALLING.

XIV.—THE RETINA AND VITREOUS.

102. AXENFELD. **Periphlebitis retinæ tuberculosa.** *Ophthalm. Gesellschaft Heidelberg*, August 5–7, 1920.

103. BACH. **Gramnegative micrococci in a panophthalmitis.** *Zentralbl f. Bacteriologie*, lxxxiv, p. 214.

104. CRISE, W. H. **Spasm of the retinal arteries.** *American Journal of Ophthalmology*, March, 1921.

105. ISCHREYT. **Circulatory disturbances of the eye.** *Zeitsch. f. Augenheilkunde*, lxiii, p. 421.

106. ISCHREYT. **Metastases.** *Ibid.*, p. 428.

107. KRÜCKMANN. **Retinitis septica.** *Virchow's Archives*, ccxxvii., No. 2.

108. QUIST. **A case of pigment stripes of the retina.** *Klinische Monatsbl. f. Augenheilkunde*, April, 1920, p. 565.

109. SIEGRIST. **The nose and the eye.** *Ophthalm. Ges. Heidelberg*, August 5–7, 1920.

110. SIEGRIST. **Glioma retinæ.** *Ibid.*

111. VERHOEFF, W. F. **Microscopic findings in a case of asteroid hyalitis.** *American Journal of Ophthalmology*, March, 1921.

QUIST (108, **Pigment stripes in the retina**) reports a case of angioid streaks in the retina. The right macula was slightly gray, with hemorrhages at the margin and some white spots to the temporal side and below. Toward the periphery were a number of brown stripes running in the direction of the choroidal vessels, and consisting of crowded brown points. The condition in the left eye was the same except that the hemorrhages were fewer.

KRÜCKMANN (107, **Retinitis septica**) has examined the retinæ of four cases pathologically. The white foci of degeneration were in the ganglion cells and the inner nerve fibers. The hemorrhages lay in all the layers of the retina. Infiltra-

tions of leucocytes, marginal arrangements of leucocytes, and œdema were absent. The pathological examination of the kidneys revealed similar pictures.

ISCHREYT (105, **Circulatory disturbances**) has seen six cases of embolism of the central artery. Two of these patients died of apoplexy. One case was bilateral and appeared sixteen days after a gastroenterostomy. Although at the time the eyes became affected there was a marked murmur with the first sound of the heart, Ischreyt does not believe an endocarditis to have been the cause, because the presence of heart disease was excluded before the operation. He is inclined to think that particles from the operation wound entered the greater circulation, Blindness came on in the course of a few hours, so the possibility of a thrombosis was not excluded.

Cases of spasm of the retinal arteries are well known and though usually of short duration, may be sufficiently protracted to produce permanent blindness in the areas supplied by the vessels affected. CRISP (104, **Spasm of the retinal arteries**) relates the case of a normal girl of 14 who became blind in the lower nasal field after an exciting automobile ride. He found the upper temporal artery interrupted a short distance from the disk by a white band of equal width with the vessel which was filled with blood on either side. The field was still defective when the case was observed eleven weeks later. He considers the condition one of spasm although the vessel walls are supposed to be transparent and invisible when not filled with blood.

ALLING.

AXENFELD (102, **Periphlebitis retinæ tuberculosa**) has found true tubercles in the walls of the veins in a periphlebitis retinæ tuberculosa, which was described by him and Stock in 1909 as the most frequent cause of juvenile recurrent intraocular hemorrhages. In many places they are situated indolently in the adventitia without obstruction of the lumen, while in other places they attack the inner layers of the true wall of the vein. This results in an extremely different course in the different places. The arteries were perfectly free. As such nodules may disappear in a few weeks, leaving no traces, they may be classed with tuberculids, or at any rate they must be held to be a true localization of bacilli. The exclusive distribution in the veins shows a noteworthy and interesting

type, which appears to be peculiar to the pathology of the brain, to which the retina belongs.

SIEGRIST (109, **The nose and the eye**) reports four cases of various kinds of disease of the retina and its vessels in which no cause could be found, aside from a coincident inflammation of the accessory sinuses, by a thorough general examination. Treatment of the accessory sinuses was followed immediately by recovery from the retinal troubles. Siegrist is therefore of the opinion that affections of the accessory sinuses can sometimes cause diseases of the retinal vessels. He also describes a case of monolateral choroiditis disseminata in a young girl, in whom an ethmoiditis on the same side appeared to be the only cause, but the opening of these cells led to a lesion in their root and the death of the patient from purulent meningitis.

SIEGRIST (110, **Glioma retinæ**) showed a sketch of a peculiar quiescent glioma, which had been exhibited by himself in 1912 and by Axenfeld in 1918. At the present time, ten years after its first appearance, the tumor remains of about the same size in the region of the macula. Central vision still remains 1.0. He also showed the ophthalmoscopic picture of a commencing glioma in the other eye, which starts from the papilla. The two pictures do not resemble each other.

BACH (103, **Gramnegative micrococci in a panophthalmitis**) reports a case in which panophthalmitis followed an operative intervention for detachment of the retina. The characteristics of the micrococci cultivated from the pus did not agree with those of the known stocks. On the slide they resembled gonococci, but were not uniform in size or shape. A luxuriant growth with mucous character was obtained on grape sugar ascites agar. Grayish white colonies grew on this as well as agar, and glycerine agar. Luxuriant growth without liquidation on gelatine. In bouillon uniform cloudiness with no formation of indol. Growth only on the surface, with no formation of gas or acid, of grape sugar. The method of infection is not certain.

ISCHREYT (106, **Metastases**) reports the case of a man 28 years old, healthy except for epilepsy, who lost his eye within a few days from panophthalmitis. Another patient had dense vitreous opacities while suffering from uræmia.

Asteroid hyalitis is distinguished from synchysis scintillans

by the shape of the opacities and absence of glistening reflexes.

VERHOEFF (111, **Microscopic findings in a case of asteroid hyalitis**) reports the microscopic and microchemic examination of a case of this sort which occurred in an eye enucleated for hemorrhagic glaucoma. He found the vitreous filled with small, nearly spherical bodies which appeared dark brown by transmitted light, a brilliant white by reflected light. They tended to form groups. They failed to stain with the ordinary reagents but took hematoxylin irregularly. No solvent seems to have been found but they emitted bubbles of gas when treated with acids which would indicate that they contained calcium carbonate. There was also a reaction for fat.

ALLING.

XV.—THE OPTIC NERVE AND TRACT.

112. BEHR. **Origin of choked disk.** *Arch. f. Ophthalm.*, ci., Nos. 2 and 3.

113. FUCHS, A. **The cerebrospinal fluid and changes in the optic nerve in syphilis.** *Ophthal. Gesellsch. Heidelberg*, August 5–7, 1920.

114. FUCHS, E. **Senile changes of the optic nerve.** *Ibid.*

115. GOERLITZ. **Histological examination of a case of blindness after great loss of blood.** *Klin. Monatsbl. f. Augenheilk.*, June, 1920.

116. HANSEN. **Ætiology and diagnosis of acute bilateral blindness.** *Munch. med. Wochenschrift*, 1920, No. 21.

FUCHS (114, **Senile changes of the optic nerve**) examined the optic tract, the chiasm, and the optic nerves taken from the cadavers of six persons between 70 and 82 years of age. Corpora amylacea were found in the intracranial portion of the optic tract in all cases, in some more than in others and in one 1500 in a section. At the entrance of the nerve into the optic canal the number of corpora amylacea diminishes abruptly, and only a few scattered ones could be found up to 15*mm* in front of the canal. In other cases the corpora amylacea disappear completely at the entrance of the nerve into the canal. The distribution of the corpora amylacea is perhaps determined by the lymph circulation, which is probably more rapid in the extracranial portion of the optic nerve than in the intracranial, so that more opportunity is afforded in the latter for the deposit of insoluble albumenoids, which the corpora

amylacea are supposed to be. When they are very numerous it may be that they impair vision through injury to the nerve fibers. In all the cases examined atrophic spots were found in the optic nerves, marked by diminution of the nerve bundles, sometimes almost to extinction, lessening of the stain of the medullary sheaths, and thickening of the septa. There was no inflammatory exudation. Most of the foci lie on the periphery of the nerves, but may penetrate and occupy up to a third of the section. They extend from the place of greatest atrophy three to five times as far upwards, toward the brain, as downwards. Few of the foci are as long as 20*mm*. The place where the foci are most marked, therefore the probable starting point, is most often in the canalicular portion of the nerve. Circulatory disturbances in the little vessels, which enter the nerve from the pial sheath and the septa, are looked upon as the probable causes. In all of the cases sclerotic changes were present in the ophthalmic artery and the central artery of the optic nerve. The peripheral situation of most of the foci must cause a contraction of the corresponding place of the visual field.

GOERLITZ (115, **Histological examination of a case of blindness after great loss of blood**) found a marked œdema of the papilla in the layer of nerve fibers without signs of inflammation. Within the layer of nerve fibers were peculiar nodules projecting above its surface and sometimes ending in a point. These were collections of polymorphous, partly nucleated cells. In the optic nerves were circumscribed foci of degeneration, close to and behind the lamina cribrosa, within which the medullary sheaths were destroyed. The fatty degeneration in the optic nerve and retina reported by Ziegler could not be demonstrated, as the globe had not been properly treated for this purpose.

BEHR (112, **Origin of choked disk**) finds the parenchymatous œdema in the glial portion and nerve fibers present in the intraorbital and intracanalicular parts of the optic nerve, but not in the intracranial. The difference between the conditions of the intracranial and intracanalicular portion of the trunk of the optic nerve is often very distinctly marked. The atrophy of the nerve begins peripherally, the papillomacular bundle remains unaffected. Hence the cause of the atrophy

is not distal, but intracranial. In one case of florid choked disk a circumscribed atrophy was found which corresponded to the exit of the ophthalmic from the carotid. The frequently found adhesions speak against the transport theory. Increase of pressure within the skull causes a stagnation within the sheath. The cell proliferation ceases with the entrance of the optic nerve into the skull. The ampulla-like dilatation may be met with in normal nerves, but not to so high a degree as in choked disk. Its presence in the latter is rather a sign of long duration; it may be absent in fresh cases.

HANSEN (116, **Ætiology and diagnosis of acute bilateral blindness**) emphasizes the value of the pupillary reactions in determining the site of the lesion. Their absence denotes that the lesion is below the primary optic ganglia, their presence that it is above. In nephritis and in lead poisoning there may be both peripheral and central causes, the former visible with the ophthalmoscope. Nothing is certain concerning the nature of the central amaurosis, whether it is toxic or caused mechanically by hydræmia or anæmia of the brain. As the central amaurosis may be mistaken for a bilateral hemianopsia, the persistence of a hemianopsia after an attack is understandable. Hysterical amaurosis cannot be an affection of the occipital cortex, as it leaves no hemianopic defect. Also the parts which transform sensory impressions cannot be affected, as there remains no disturbance of optic memory. Tumors may impair the vision of both eyes when they are situated in the region of the chiasm, or when so situated in the occipital lobe as to compress both visual centers. When in blindness following meningitis the pupillary reactions and the fundus are intact, it must be assumed that the exudate is in the region of the calcarine fissure. Basal meningitis creates ophthalmoscopic and pupillary symptoms, yet the former may be absent. Each visual center may be affected by vascular diseases, such as embolism and thrombosis. Ruptured aneurysms and hemorrhages during whooping cough may destroy vision. Blindness may also be caused by infections and intoxications, such as methyl alcohol and optochin, and also by wounds of the skull.

A. FUCHS (113, **The cerebrospinal fluid and changes in the optic nerve in syphilis**) examined 84 syphilitics with positive

cerebrospinal fluid and found the optic nerves involved in 13. Six out of 46 patients who had been syphilitic longer than two years had papillitis with normal vision. He believes that no essential difference exists between a papillitis with normal vision and field, and one in which there are slight defects in the field, as all manner of transitions were found. A small central scotoma may exist at first and pass away, leaving the vision normal. In two cases of fresh syphilis he found an optic neuritis and negative cerebrospinal fluid. He gives the histological findings in the retrobulbar part of the optic nerve taken from a patient who had had a meningeal papillitis of both eyes, recovered from this so that the fundus presented a normal appearance, and died from acute yellow atrophy of the liver, following administration of salvarsan. The sheaths of the optic nerve, the vessels, and the connective tissue septa were normal, but in the marginal bundles of the nerve there was a considerable increase of glia in places and a moderate number of lymphocytes.

XVI.—ACCIDENTS AND FOREIGN BODIES.

117. LAUBER. **A case of extensive avulsion of the iris.** *Zentralbl. f. prakt. Augenheilkunde*, November-December, 1920, p. 197.

118. OLLENDORF. **Splinter of iron extracted from the iris 30 years after the injury.** *Zeitschr. f. Augenheilk.*, xliii., p. 571.

119. WEIGANDT. **Vegetable foreign bodies in the conjunctiva.** *Zentralbl. f. prakt. Augenheilk.*, November-December, 1920, p. 202.

In two months of observation of a case in which a large extent of the iris had been torn away from its root by a blow from the tail of a horse, LAUBER (117, **Extensive avulsion of the iris**) noticed that there was a total absence of inflammation, and of any signs of atrophy in the detached portion of the iris. The iris was detached from the ciliary body throughout three-fourths of its extent, and was connected with it only in its lower outer portion. A perforating wound of the globe was positively excluded. The lens was clear, and lay in its normal place without trembling. The ciliary injection disappeared in a few days after the injury, no signs of inflammation appeared, and the final vision was good.

Praun exhibited a patient in 1898 to prove that a piece of iron can remain in the eye for a long time, then nine years,

without causing any trouble. At the end of thirty years a severe iritis set in, with a slight local siderosis in the iris and lens. OLLENDORF (118, **Splinter of iron extracted from the iris 30 years after the injury**) extracted the piece of iron with a Hirschberg magnet, and recovery followed in a few days, leaving the eye with one fifth normal vision.

WEIGANDT (119, **Vegetable foreign bodies in the conjunctiva**) reports two cases of this nature. In the first a spine of a burr that had been thrown against the eye was found embedded in a mass of granulations in the upper lid, where it had acted as the cause of an extensive erosion of the epithelium of the cornea and a slight iritis. In the second case a conjunctivitis had existed for half a year, with much swelling of the upper lid and the formation of polyps. The exciting cause was found to be a yellow, threadlike structure lying amidst these granulations, which proved to be a coiled up blade of grass 8*cm* long.